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Journal of the Society of Arts.

FRIDAY, DECEMBER 24, 1869.

Announcements by the Council.

The Society's Shilling Colour-box.

It will be remembered that, in 1852, the Society's medal was awarded to the late Mr. Joshua Rogers, for the best shilling colour-box, and some years afterwards the Council also gave its approval to a shilling colour-box manufactured by Mr. Miller, of Long-acre.

The Council have received a letter from Mr. J. Rogers, son and successor to the late Mr. Rogers, drawing their attention to the fact that other manufacturers are selling colour-boxes with the words, "as recommended by the Society of Arts," or in some other form making use of the words "Society of Arts," which are usually printed upon the box in prominent capitals, and in some cases actually impressed upon the cakes of colour.

The Council have directed the Secretary to write to all such manufacturers cautioning them against this unauthorized use of the Society's name.

It may be added that Mr. Rogers mentions in his letter that upwards of seven million boxes have been sold by his firm since the Society's medal was awarded.

Collection of Engravings and Prints.

The collection of prints produced by various processes, used to illustrate Mr. Davenport's paper, "On Prints and their Production," read on Wednesday evening, the 8th instant, will be open for the inspection of members and their friends, between the hours of 10 and 4 o'clock, up to Saturday, the 8th January, 1870, inclusive.

A brief account of the collection is given at page 121.

Cantor Lectures.

The third and concluding lecture of the course "On the Spectroscope and its Applications," by J. **Norman Lockyer**, Esq., F.R.S., was delivered on Monday evening last, the 20th inst. The whole course of lectures will be published in the *Journal.*

Channel Steamers.

The Committee met on Wednesday, the 22nd December. Present, Admiral Ommanney, F.R.S., in the chair; Captain Boxer, R.N.; Messrs. C. W. Merrifield, F.R.S., E. J. Reed, C.B., and Seymour Teulon. The Committee proceeded to consider their report, and adjourned for further consideration.

Donations to the Library.

The following works have been presented to the Library, and the thanks of the Council have been communicated to the donors:—

The Rob Roy on the Jordan; a Canoe Cruise in Palestine and Egypt. By John Macgregor, M.A.; presented by the author.

A Pamphlet on School Museums, with Suggestions for their Formation. By W. E. Bayles; presented by the author.

Proceedings of the Society.

India Committee.

The second Conference of the session, on subjects connected with India, was held on Friday, December 10th, W. S. **Fitzwilliam**, Esq., late member of the Supreme Legislative Council of India, in the chair.

Mr. **Hyde Clarke** said that the reason Mr. Fitzwilliam had been asked to take the chair was because he had for many years been advocating the establishment of a gold currency for India, and had been the first to draw the attention of the Indian government to its necessity and convenience.

The paper read was—

ON A GOLD CURRENCY FOR INDIA.

By Andrew Cassels, Esq.

I approach the subject of "A Gold Currency for India" with much distrust in my ability to sketch even its outlines with the clearness that is due to its importance. But I hope that the speakers who will follow me this evening will be able to supply the details and information I may fail to give. I will endeavour to be as brief as possible, in order to leave time for discussion after my task is done.

The inadequacy of a silver currency to the wants of so vast a country as India is a subject which, from time to time, for several years back, has attracted the attention of thinking men in both India and England, but the question was first prominently brought forward at the commencement of the year 1864, in consequence of the extraordinary expansion which had at that period been given to trade in Bombay, by the demand from Europe for cotton to supply the vacuum created by the cessation of production in the Southern States of America, during the continuance of the civil war. The merit of having taken the initiative in drawing public attention to the question is due to my brother, at that time a member of the Legislative Council of Bombay. In a letter, dated the 1st of January, 1864, and addressed to Sir Bartle Frere, at that period the Governor of his Presidency, Mr. Walter R. Cassels pointed out very forcibly the total inadequacy of a silver currency to deal with the increasing trade of our Indian empire, and the desirableness of superseding it by a gold currency. The Bombay Chamber of Commerce and the Bombay Native Association immediately memorialised government in favour of the proposed change of system. The Chambers of Commerce of Calcutta and Madras followed in the same spirit. The movement was warmly supported by the Manchester Chamber of Commerce, both by memorial and by deputation to the Secretary of State for India. Shortly afterwards, a commission to inquire into the state of the currency was appointed by the Governor-General of India in Council. The commission had for its president that very able man, Sir William Mansfield, and its report was handed in to government in October, 1866. Its conclusions were in favour of re-introducing a gold currency. But though it has been understood that the government of India admitted the force of the reasons that had been advanced in favour of the proposed change, and were only checked by the technical difficulties which had to be considered and surmounted, India is still, at the end of 1869, without a gold currency.

The government of India has indeed virtually rescinded the prohibition to receive gold in payment of its dues, which it issued in 1852, when the gold discoveries of California and Australia were startling the world. In the first instance, permission was given to its officers to receive the sovereign as the equivalent of 10 rupees 2 annas, but as the sovereign was at that time very current in the bazaar at a better rate, little or no gold was then tendered to the State. Subsequently, the Treasury was allowed to receive the sovereign as the equivalent of 10 rupees 4 annas, and this arrangement is still in force. But it contains no elements of stability, and is, and no doubt was intended to be, a temporary or subsidiary measure only.

The desirableness of re-introducing a gold coinage into India will not be disputed by many of those who have resided in India, and are practically acquainted with the inconveniences which attend a silver currency. The external trade of India may safely be said to amount in value to 100 millions sterling per annum. The amount of coin in circulation in a country which contains about 200 millions of people must be very large; it was estimated by the late Mr. Wilson at 100 millions sterling in his time. A trade and circulation such as these call for a less cumbrous and inconvenient currency than a silver one. And when a monetary crisis occurs —and such crises do occur but too frequently in the mercantile world—its pressure is aggravated by the fact that silver only is a legal tender. The mints of the three Presidencies are then kept at work day and night, but all the rupees they can coin are totally inadequate to the wants of the community. If the same mechanical power could be applied to the coinage of gold, a large, and perhaps a sufficient, amount of money could be produced. During a recent monetary crisis at Bombay, a quantity of silver, valued at 80 lakhs, or £800,000, was lying in the mint of the presidency, waiting for conversion into rupees.

In private life, the inconvenience of a silver currency is universally felt. It may be said that no European or native gentleman ever carries money about with him on his person. The transport of silver for mercantile or other purposes is attended with difficulty and expense. The late Mr. Wilson, in his currency speech of 1860, stated that he had seen an estimate made by Sir Charles Napier, that in his day the protection of government treasure, in escort and in other ways, gave employment to something like 30,000 native troops. Then the wastage of silver coins, which are constantly being turned over, is very considerable, and the coinage of silver is an extremely costly process, when compared with that of the more precious metal.

It has been calculated that the average production of gold and silver in the world, during the fifteen years commencing in 1849 and ending in 1863, inclusive, was as follows:—Gold, £34,002,400 per annum; silver, £16,735,666. These figures furnish another strong argument in favour of substituting a gold for a silver currency in India. It seems to be impossible at present to obtain in this country complete returns of the import of treasure into India, up to any date later than April, 1866. The amount imported during the ten years ending in 1866 was £179,424,403. The import into Bombay alone during the fifteen years ending in 1868-69, according to a statement which I have seen, and which was compiled with great care, reached the large sum of £143,534,091. Of course a not inconsiderable quantity of gold is included in these imports, but I believe that a careful analysis of the nature of the bullion and coin poured into India for years back, would show that India is absorbing all—or almost all—the silver that the world produces.

The late Mr. Wilson, Mr. Laing, Sir Charles Trevelyan, and other eminent public men, have all pronounced the adoption of a silver currency for India to have been a mistake. Sir Charles Trevelyan, in a letter addressed some years ago to the *Times*, summed up the charges against it in the following words:—

"When the cost of conveyance, protection, and insurance, the time spent in counting, examining and weighing, the wear and tear of so vast a mass of coin, and the habitual exactions of the shroffs (money-changers) consequent on that wear and tear, are considered in connection with the present advanced state of knowledge, it may reasonably be maintained that the silver money of British India is a greater barbarism than the iron money of Sparta."

It may be added that the substitution of a gold for a silver currency in India would have but a slightly disturbing effect upon the public mind. India had her own gold coinage of old, and the re-introduction of a gold coinage would therefore appear to be no new or startling experiment. Within the last few years, we have seen gold ingots, stamped with the names of some of the leading banks of Bombay, in circulation in the interior of the Western Presidency. Sir William Mansfield, writing in March, 1864, states that no less than 21 millions of gold had been imported into India since Mr. Wilson's currency scheme was propounded, say since 1860-61.

At the present moment, the state of trade is not such as to cause large quantities of silver to be forwarded to India. But what has been may again be. We have seen the bullion market of England thrown into a state of feverish excitement, and the silver coinage of France swept away, by a demand for the East. Is it impossible, or even improbable, that India should again, and at no distant date, attract enormous quantities of silver to her shores, to the great disturbance of the money markets of Europe? The failure, or even the partial failure, of one year's crop of cotton in America would, in all likelihood, bring such an event to pass.

But the late Mr. Wilson has left upon record his opinion that, though the currency of India was in a most unsatisfactory state, and that if we had to begin *de novo*, no one would doubt that a gold standard, supplemented by silver tokens of limited tender, would be a much preferable plan to that which is in use, yet, as the debt of India had been contracted in silver, so must it be paid in silver; and, therefore, that a change was beset with difficulties. The opinions of so eminent a man are entitled to the greatest respect; but, I confess, I fail to see the matter in the light in which it appeared to him. His objection might be met by the question, if an erroneous system has once been adopted, can no economy or improvement be introduced by a government charged with the duty of advancing improvement and civilisation in a State? Mr. Walter Cassels, in his excellent letter to Sir Bartle Frere, and Sir William Mansfield, in an able treatise published a few months later in 1864, have shown, I think conclusively, that Mr. Wilson had not given the subject his mature consideration, and that his objection would not bear close and searching scrutiny.

But even if it be admitted that Mr. Wilson was right, and that the debt of India, having been contracted in silver, must be paid off in silver, would it not be prudent to raise loans in gold, to pay off all old loans, and to cancel all such obligations? Of the public debt of India, twenty millions sterling cannot be liquidated before 1872, and five millions are not redeemable before 1879. The remainder may be paid off at any time, I believe. If, as many of us think, the prosperity and commerce of India are likely to increase in an extraordinary degree under the fostering influence of new roads, rail-roads, canals, works of irrigation, &c., must not the value of silver advance, if all this prosperity and commerce are to be based on a silver currency only? Surely, the State is bound to protect the interests of the debtor as well as those of the creditor. Will it fulfil that duty if its debt be permitted to become more onerous because of a rise in the value of silver?

It would, therefore, seem to be very desirable that steps should be taken by the government of India to supersede that silver currency which is at present in use, and to adopt a gold standard instead.

When we come to deal with the details of a gold coinage, the task is a different one, and I feel great diffidence in giving any opinion on a subject of such grave importance.

On the one hand, it has been proposed to issue gold coins similar to the sovereign and half-sovereign, of the value of Rs. 10 and Rs. 5 respectively. On the other, it is suggested that the government of India should re-issue a gold mohur and gold half mohur, representing a value of Rs. 15 and Rs. 7½ respectively. The advocates of the latter scheme maintain that it would be desirable that India should possess a distinct and separate coinage of her own, and that nothing could be more seemly or natural than that India should re-issue the old familiar coins of India. It appears to them that, in this way, the silver currency could be gradually and quietly converted into a gold one, without disturbance to the public mind or to private interests.

But it seems to me that a more philosophical plan, and one more likely to be a permanent settlement of the question, would be to issue an Indian sovereign and half-sovereign, which should be a legal tender in England, with subsidiary silver tokens of such value, as silver, that they could never be preferred to gold. Is the hope that England and all her colonies may one day have but one and the same language and one and the same coinage—a mere day-dream? I think not. Already the sovereign of Australia is in circulation in the mother country, and is well known in India. Why should not an Indian sovereign circulate equally freely in Australia and at home? The technical difficulties which lie in the way of fixing the Indian mint value of gold would have to be considered and surmounted by scientific men. The present silver coinage would have to be called in gradually, and to be replaced by a new one.

The establishment of a gold currency would have to be followed, I presume, by a short transition period, during which either gold or silver—the latter, perhaps, to a limited extent only—should be a legal tender. The greater portability and convenience of gold would soon bring it into general favour and use.

I have purposely excluded the consideration of a paper currency for India from my remarks, though no one can be more deeply impressed with a conviction of the desirableness of a paper currency, based on a metallic standard, than I am. But whether you have a paper currency or not, a gold standard for India is, in my opinion, a necessity.

Such are the mere outlines of this important subject, and for which I am chiefly indebted to the writings of my brother and Sir William Mansfield—in some instances I have used their own words. I wish it had been in my power to have brought the matter more forcibly and vividly before you. I shall be glad indeed if light is thrown upon it in the course of the discussion of this evening. It is attended with some difficulties, no doubt; but I feel that it deserves the serious consideration of everyone who is interested in the progress and material prosperity of India. Mr. Laing, Sir Charles Trevelyan, and other distinguished men, have pronounced the silver currency of India to be a "barbarism." Unfortunately, they have been content to denounce an unsound financial system; they have one and all shrunk from the labour and responsibility of introducing a better one. But I have no doubt whatever that, sooner or later, the irresistible force of public opinion will compel the government of India to substitute a gold currency for the cumbrous, wasteful, and inadequate silver currency, which at present is permitted to cramp and harass the commerce of the empire.

Mr. **Frederick Hendriks**, F.S.S., said that they had heard an Indian view of the subject; he now begged leave to give them the ideas of one who looked upon the matter from an English point of view, and he would entitle his remarks, "Suggestions for a Gold Currency for India, in connection with International Coinage":—

Notwithstanding the unanimous decisions of repeated commissions of inquiry in India, in favour of the speediest practicable introduction of a gold currency, and especially the resolution, No. 1,325, of the government of India, dated Simla, 12th July, 1864; the report of the commission over which General Sir William Mansfield presided, dated Simla, 4th of October, 1866; and the strong recommendation of Sir Richard Temple, in his last financial statement to the Legislative Council of India, at their meeting in Calcutta, on the 6th March, 1869,[*] the question has, more or less persistently, been put upon the shelf. It has, apparently, been placed aside for the advent of some more auspicious occasion, as was formerly the case with the well-conceived intentions in favour of a gold currency, so frequently expressed in by-gone years by Sir Charles Trevelyan and Lord Halifax. No more seems likely to come of it than reference to the Secretary of State for India in Council, who, in turn, may probably relegate it again to India; and thus the matter may, for an indefinite term, be handed backwards and forwards, until the pressure of circumstances brings itself to bear upon it in England as well as in India. The question is, however, not only one of great practical moment, but one upon which a speedy decision, and something like a consent of public opinion, is of pressing importance, in view of the general tendency of all the great commercial nations, at the present time, towards the favourable consideration and adoption of plans for the unification and internationalisation of their various systems of coinage.

The only difficulties advanced, with any appearance of sound foundation, as obstacles in the way of a single gold standard of currency for India, are—

1. The prevalence there, for so long a period, of a single silver standard, and the alleged existence of so vast an accumulation of silver coin, that it would be difficult or dangerous to displace or to demonetise it.

2. That taking the average commercial price of the English sovereign in India upon an average of years, it does not represent 10 rupees, but 10 rupees and one quarter (*i.e.*, 10 rupees 4 annas), and that, consequently, we cannot adopt Sir Charles Trevelyan or Lord Halifax's views of making 10 rupees equal to one sovereign, which would lay the foundation of an international coinage,

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[*] "The provision of an effective gold currency for India has engaged our earnest attention. The offer of 10 rupees for the sovereign at our treasuries, by the notification of 1864, having been found by experience to be insufficient to attract sovereigns, and to declare the fulfilled intention of facilitating the circulation of that coin, we determined, in November last, to offer 10 rupees and 4 annas for the sovereign, a rate more nearly approaching to its intrinsic and market value. This measure has met with some success, for already upwards of 100,000 sovereigns have been received at our treasuries, and taken out again by the public. We have also removed the prohibition, existing since 1852, against receiving at our treasuries the gold pieces coined under Act xvii. of 1835, of which coin numbers (more than 1¼ million) have been, and still are being, coined at our mints, in exchange for gold bullion received from the public—a sure proof of the popular demand for them. Thus, by improving the rate offered for the sovereign; by assimilating it to the standard established by law for coinage of gold in India; by restoring the status which the Indian gold coins properly possess, and which they only lost casually in 1852, we hope to obtain such a circulation of gold coins in India as may hereafter justify their being declared to be legal tender.'

and be a link of union between the finance of India and of other great countries, but must perpetuate awkward fractions, and come to the conclusion aimed at in the 51st paragraph of Sir William Mansfield's minute of the 4th August, 1864, in which he observed:—"We can hardly then resist the conclusion that the golden multiple of the rupee should be calculated and minted with regard to the value of the rupee only, and apart from all other considerations, sovereigns being allowed to run for their relative value."

The answer to difficulty No. 1 is, that the idea of the immense amount of silver coin existing in India is a mere myth. There is no collateral testimony to prove it. On the contrary, so far as it extends, the collateral testimony rather disproves the existence of anything of the kind. It is certainly matter of statistical history that, during the British rule in India, from the year 1800, about £250,000,000 sterling worth of silver rupees have been coined at the mints of Calcutta, Madras, and Bombay. But when we take the analogy of other countries as our guide to form an estimate of what proportion of this £250,000,000 worth has passed out of circulation, or represents meltings or repeated re-meltings of old, worn-out coinage into new, we may question whether more than forty per cent. of the total now exists in the shape of rupees, say 1,000,000,000 rupees, or £100,000,000 sterling worth. It is pretty well determined that about 50 per cent. of the gold coinage of England, since 1816, and about 80 per cent. of the American gold coinage, since 1792, has disappeared from circulation. The wear and re-coinage of silver coinage, the exclusive national circulation in India until recent times, when bank notes have come in aid, must have been vastly greater than that of any gold circulation in European or American countries. Silver coin is softer, more liable to abrasion, than gold coin, and is thus more rapidly deteriorated below the limit of legal tender weight, so that its duration, without need for re-coinage, is very much shorter.[*] Then, again, in India, it is notorious that vast amounts of rupee coinage are constantly melted down, for conversion into objects of use, of a domestic and artistic character, and into personal ornaments, such as the bangles for arms and legs, so generally worn by an enormous native population. That 40 per cent. of the whole aggregate original amount of silver coined since 1800, in India, should still remain in circulation, is a liberal and, perhaps, even an over-estimate. The history of financial operations in British India may be appealed to, as supplying a strong instance in point, as to over-estimation of the quantity of coin in circulation, by the highest authorities whose opinion could be appealed to by our government there. We refer to the example of what occurred in the period 1835-39. The Act xvii., of 1835, the Magna Charta of the existing Indian silver standard coin, was passed to give effect to a long meditated purpose of establishing one coinage of a uniform character, and bearing a British device. It was reckoned before-hand that the amount of sicca rupees then current, and to be brought to the mint for re-coinage, would amount to a sum of very great magnitude. But what was really the result, when certainty took the place of hypothesis, was the effectual substitution of company's rupees for sicca rupees by a re-coinage of less than five crores, or under one-half of the lowest estimate that had been formed, in anticipation, on the basis of the aggregate amount of sicca rupees issued from the Mint in the preceding 30 years.

We now revert to difficulty No. 2, that the equivalent of the English sovereign must be counted at ten rupees and a fraction, instead of at ten rupees precisely, and that, consequently, it cannot be made either international, as between England and India, like the sovereign of Australia is as between that country and England; and, *à fortiori*, that it must remain also non-international so far as regards a junction with the Monetary Convention of Paris of December 1865, which repudiates all coins that are uneven multiples of five francs of gold.

But this second difficulty is just as imaginary and unsubstantial as the first. This can neither be explained nor understood without some minute reference to figures. It is proposed now to examine these in the most compendious manner that the inherent complexity of the question will admit.

The government of India has made a wrong calculation, in agreeing to take English and Australian sovereigns at the value of ten rupees and four annas. Their notification, dated Simla, 28th October, 1868, is based on the erroneous conclusion that such a tariff of conversion of the sovereign is in conformity with the values of the gold pieces stated in section 13 of Act xvii. of the government of India, 1835. The notification of October 28, 1868, also sets forth that the gold pieces stated in section 13 of Act xvii. of 1835, will thenceforth be received in all treasuries of British India and its dependencies, according to the values stated in that Act. The modified legal tender, so far as the government is concerned, which this notification of the government gives to the English and Australian sovereign, in authoritatively regulating the terms on which it is to be paid and received in proportion to Indian coin, is correct enough if the word "weights" were substituted for "values," but it is not correct in its actual form and practical application, when it is borne in mind that a diferential rate of seignorage in India between silver bullion, on which it is two per cent., and gold bullion, on which it is one per cent., affects "values," and makes the mere comparison of proportionate weights of gold and silver coin, involved in the government calculation, neither equitable nor applicable to a solemn legislative enactment on the standard, if such should come to be recommended in India on the basis of the notification of October 28, 1868.

The Act xvii., of 1835, established a proportion, in intrinsic weight, of 15 silver to 1 gold in the Indian currency. The silver rupee is there defined (see clause 1) as of 180 grains troy, and the standard 11-12ths, or 165 grains of pure silver, with 1-12th, or 15 grains, of alloy; and the gold mohur-piece of 15 rupees (see clause 7) as of the same weight, 180 grains troy; and its standard 11-12ths or 165 grains of pure gold, with 1-12th or 15 grains of alloy.

If this intrinsic proportion of weight were the correct one of value, either according to the practical experience of the relative present worth of gold in the open markets of the world, which it is not conformable to; or else, if it were practicable, which it is not, to have a fixed double standard which should not perpetually oscillate, then the estimate of the government of India, under its notification of 28th October, 1868, might be justified, irrespective of the question of seignorage on bullion, to be presently adverted to in further detail. The proportion of 15 to 1, translated into trade language, means a price of 62⅞ pence per ounce troy of standard silver; but the value of that commodity in the London market has been as low as 60 pence per ounce troy during the present year, 1869. This means a proportion of 15.7165 to 1 between silver bullion and mint price of gold respectively in England. And, similarly, the proportionate values of the two metals in India are, and must remain, ever oscillating and departing from the assumed statutory standard. In fact, the establishment of a fixed ratio for the two metals, or a permanent double standard, is impracticable. It is a mere dream, like that for the discovery of a perpetual motion, or of the philosopher's stone.

It is easy to see how the estimate of the English sovereign, at 10¼ rupees, by the government of India, can be made out on the principle of comparative weight; whilst, as regards value, it is erroneous. The silver rupee contains 165 grains of pure silver, and the British and Australian sovereign 113·0016051 grains of pure gold. This, on the hypothesis of the proportion of 15 silver to 1 gold, gives a weight of 113·0016051×15 = 1695·0240765 grains of pure silver as the assumed value of the sovereign. Now the out-turn in silver rupees of such a number of grains is 1695·0240765 divided by 165, giving an exchange of 10·27287 rupees per sovereign, or a fraction of about ⅓ of an anna above the 10 rupees and 4 annas at which the Indian government (with the view of avoiding fractions), have thus hypothetically estimated the sovereign at 10·25 rupees in decimal notation.

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[*] As an example of the great wear and waste of silver coin, we may appropriately take note of the results of the experiments made in 1833, at the Royal Mint in London, when Lord Auckland was Master of the Mint, which showed that the average loss upon coin four years in circulation was £1 8s 7d. per £100 value for sixpenny pieces; 8s. 11d. for shillings; 7s. 2d. for half-crowns; and the average loss upon coin 16 years in circulation was £5 11s. 11d. for sixpences £4 19s. for shillings: and £2 7s. 7d. for half-crowns, per £100 value.

But the proportion of 15 to 1 which that government has used in its calculation, is unreal, imaginary, and infected with error at the outset. The proportion has always been disturbed by the differential rate of seignorage charged by the Indian Mint upon gold and silver bullion respectively, when imported into the mint for coinage. Instead of having been 15 to 1, it may be clearly shown to have been, and still to be, in the practical working, 15·15306 silver to 1 gold, or what we should call in England a price of 62¼d. per ounce of silver bullion.

The silver rupee, including the mint charge of 2 per cent. seignorage on silver bullion, has, since the year 1835, been equal, in purchasing power in India, to 168·367347 grains of pure silver bullion to each silver rupee, containing 165 grains only of pure silver. And the gold rupee, including the mint charge in India of 1 per cent. seignorage on gold bullion, has, during the same period, been equal, in purchasing power or value, to 11·11111 grains of pure gold bullion to each rupee of gold coinage containing 11 grains only of pure gold.

Then, dividing 168·367347, the value in pure silver bullion, of the silver rupee, by 11·11111, the value, in pure gold bullion, of the rupee in Indian gold coinage, we have the proportion of 15·15306 to 1, the relative value of the two coinages, as before stated, and as opposed to 15 to 1, their relative weights.

And as the intrinsic pure gold weight of each sovereign which comes into India, as it leaves England, free from seignorage, is 113·0016051 grains, that weight, divided by 11·1111111 grains (being the weight of pure gold bullion, of which the intrinsic weight of one rupee of gold coinage is the equivalent in value), gives a quotient of 10·170144 rupees as the proper estimate of the value of the sovereign in India, according to Indian laws and mint regulations as to seignorage, and not 10·25 rupees (or 10 rupees 4 annas) the amount at which the government of India has over-estimated the sovereign. Instead, therefore, of the notification giving such a value to the sovereign, its value should have been declared equal to 10 rupees, 2 annas, and 9 pies, that being the nearest expression to 10·170144 rupees in current coin, the exact decimal expression for this sum of current coin being 10·171875, an inconsiderable fraction of difference under the circumstances.

Taking it then as established that the mint ratio in India of silver to gold is 15·15306 to 1 in value, as compared with 15 to 1 in weight, the difference, of say 2 annas and 9 pies is, all that remains to be bridged over to make 10 rupees and 1 sovereign of its present weight identical in value, which is 1 anna and 3 pies less than the difference of 4 annas assumed by the government of India as the correct sum. This difference of 2 annas and 9 pies, upon 10 rupees 2 annas and 9 pies amounts to an alteration of 1·68971 per cent., to which extent the weight of the present sovereign would have to be reduced to bring it to the identical value in India of 10 rupees of gold, after allowance for 1 per cent. of seignorage.

Fortunately for the prospects of an international coinage for India, it may be considered in conjunction with the proposal of Mr. Lowe, the Chancellor of the Exchequer, to reduce the British sovereign to the extent of 0·87843 per cent., in order to make it identical with 25 francs of gold. Such a reduction would bring it into conformity with the coins of the Convention of December, 1865, including France, Italy, Switzerland, Belgium, Austria, and doubtless, by-and-bye, America, with which countries India has a very large amount of direct trade, and is consequently interested in improving the machinery whereby it is carried on and extended. The difference between 0·87843 per cent., to make the present sovereign international, and 1·68971 per cent., to make the future 10-rupee piece of India and the new international sovereign identical, is no more than 0·81128 per cent. The alteration in India and in England to attain this great object may be said to require no greater sacrifice in the one case than in the other. Moreover, the very amount of seignorage (1 per cent.) which is contemplated to be introduced into England and all other countries, parties to the Convention of December, 1865, is, as explained, already in force in India. And, as in India at the present time, the delivery of coin in exchange for bullion at the mint is attended with delay, whilst in an international system immediate delivery would have to be given, as it now is in England, the further reduction of 0·81128 per cent. in Indian present value of the sovereign would no more than represent a fair compensation to the Indian mint on the delay in delivery of coin for bullion being abolished.

The following sketch, subject possibly to some few modifications of detail, is therefore submitted as a method by which a gold currency could speedily and effectually be introduced into India, and which might, by concert with England and America, become a perfect international scheme in the sense of the Monetary Convention of Paris, of December, 1865:—

Article 1.—India to join the Monetary Convention of December, 1865, so far as regards the weights and standards of its gold coins, on the basis of 2½ rupees of its gold coinage being made equal, in weight and pureness, to 5 francs of French gold coinage, 1 dollar of American coinage.

Article 2.—India to establish a temporary transitional double standard of gold and silver, for the discharge of debts, according to the debtor's option, in either of the metals, to cease absolutely at the end of five years.

Article 3.—India to stop all further coinage of 1 rupee pieces in silver for the next five years.

Article 4.—India to coin, during the next five years, all denominations of silver under the value of 1 rupee of the same standard and weight as the English silver token money, namely, at the rate of 62 half-rupees to each pound troy of silver of English standard fineness.

Article 5.—India to resolve, by legislative enactment, that, at the end of five years, gold alone shall be the standard, and silver coin legal tender to the value of 100 rupees only.

Article 6.—India to call in, at the end of five years, the silver coins, both rupees and lesser denominations, minted before the commencement of the period of five years, and to deal with them as was done with the sicca rupees in 1835-38, when it was ordered that from the 1st of January, 1838, they should cease to be a legal tender, though received by the collectors of land revenue, and at all public treasuries, by weight, and subject to a charge of 1 per cent. for re-coinage.

Article 7.—India to coin all fresh issues of rupees or lesser coins of silver at the end of the five years, at the rate of 31 rupees to one pound troy of silver of standard English fineness, *i.e.*, to make them of the exact weight and fineness of the English florin, two-shilling, or 100-mil pieces.

Article 8.—India to decimalise its coinage at the end of five years, by converting the rupees into 200 new pies, or half-mils English, instead of the 192 pies of which it now consists. The present inconvenient subdivision of 16 annas to the rupee, and 12 pies to the anna, will thus be got rid of; and there would be ten new annas, of 20 new pies each, to the rupee, each new anna to be equal to 10 mils English, or $\frac{1}{100}$th part of a pound; each new rupee to be one florin, or 100 mils; and each new pie, as a coin of circulation rather than of account, to be half a mil English, or $\frac{1}{2000}$th part of a pound. This minuter subdivision than in European countries is necessary for India, as a poorer country, with smaller wages, and lower prices of necessaries of life; and, as to any difficulty of the population in understanding the alteration, there is not the least ground for apprehension. The countrymen of the author of such arithmetical works as the "Lilawati" and the "Vija Ganita" are too clever as calculators to experience any feeling of hardship at adapting themselves to a change of greater benefit to themselves than any of the plans for consolidating the numerous kinds of rupees, both of silver and of gold coinage, and of various mintages and weights, which used formerly to circulate, and still do to some extent, in the British Empire in the East. *

It only remains to be noted that the weight of every gold coin, under the plan of the new currency, would be in simple and harmonious relation with the metrical system, and that the exact weight, in that system, of any number of rupees, could be ascertained by simply dividing them by 1,240. Thus, to ascertain the weight of 10 rupees, or 1 international new sovereign (or 5 dollars, when America joins the Convention), or 25 francs, we have but to divide 10 by 1,240, and the quotient is 8·064516 grams, the weight in gold nine-tenths fine, according to the stipulations and articles of the Paris Convention, of December, 1865. Similarly, 3,100 rupees of India, or florins of Austrian gold currency, would weigh 2½ kilogrammes; 3,100 dollars, or 5 franc pieces, 5 kilogrammes; 3,100 gold francs of any country in the Convention, 1 kilogramme; 3,100 napoleons, 20 kilogrammes; and 3,100 new international sovereigns, or 25 franc pieces, 25 kilogrammes. All exchange tables, for the conversion of one coin into another at intrinsic par, would then be unnecessary, and the real values of the coins of all great commercial nations would be perfectly easy to understand, even by any child instructed in the first rules of decimal arithmetic, and of the metrical system of weights which it is the avowed intention of the government of India to introduce into that country as soon as practicable.

Mr. Rowland Hamilton said he could not enter into the details of the remarks which had been made by Mr. Cassels and Mr. Hendriks. With regard to the more general point to which Mr. Cassels had alluded, he thought there could be little doubt that a gold currency was better than a silver one. It was more exact, and one which presented greater facilities for all operations of commerce. Whether a much larger aggregate amount of bullion would be required to carry on the increasing trade of India, did not appear to him at all certain. Improvements in the general monetary system would greatly tend to economise the use of bullion, and save all the waste of carrying it backwards and forwards. For some time to come, a large amount of silver coin would be required for the more ignorant dealers in the remoter parts of the country, who would not be satisfied without actually seeing the silver for which they sold their commodities. The most effectual means of saving waste of this kind, would be by the introduction of a note currency, which would, by degrees, be received, pass from hand to hand without expense, and thus, in fact, transfer the ownership of bullion without needless moving the bullion itself, which would actually be paid in coin only on the ultimate presentation of the note at its place of issue. The point, as it appeared to him, to which the attention of government should be chiefly directed was, to determine the equivalents of value that should be adopted as for gold and silver respectively. It is admitted on all sides that a gold standard is desirable, but it must be borne in mind that all monetary obligations, bills of exchange, taxes, mortgages, and the like were now expressed in a silver standard. What, then, in the first place, is to be taken as the value of the rupee. In the first instance, at all events, the quantity of silver required to make the rupee, not the weight of the rupee after deducting a seignorage and mintage of $2\frac{1}{10}$ per cent., should be taken; that is, rather more than 183¾ grains, instead of the tola of 180 grains, which was the weight of the rupee as issued from the mint, and this larger weight he had adopted in all the calculations he had made of the comparative value of the rupee and the gold coins proposed. He would remark, however, that the value given to a coin by such a seignorage is not of the same nature and stability as that which rests upon its weight in bullion, for the value of the seignorage depends on the utility of the coin as coin, circulating within comparatively narrow limits, and adapted only to its own special purpose. If coin be issued in excess, it could only be utilised by melting it down, but the value of the bullion depended on the far larger average afforded by the markets of the whole world. Such a proposition as that of the Chancellor of the Exchequer, to take a seignorage off our standard coin, certainly subjected it to new risks and conditions. Coming to the question of the equivalent in gold to the existing rupee; taking, as mentioned before, not the actual weight of the rupee itself, but the larger weight required to be given to the mint to get the rupee (viz., 183·861 grains troy), he could not arrive at the same conclusions as those stated by Mr. Hendriks, as regards the relative value of the two metals. He did not think much value could be given to the quotations of gold in the Indian markets, which would be much affected by the perturbations in international exchange. Silver being the standard fixed in India, could show no fluctuation there, but the enhanced price in Europe had been in a great measure owing to Indian demand. A high price of silver in

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* The present system of coinage in British India is:—

$\frac{1}{192}$ of a rupee .... equal 1 pie.
3 pies .... „ 1 paisa, or pice, or ¼ anna.
12 pies .... „ 1 anna.
16 annas .... „ 1 rupee.
15 rupees .... „ 1 gold-rupee.
16 rupees .... „ 1 gold-mohur.

And the proposed new system of international coinage for India would be as follows:—

$\frac{1}{200}$ of a rupee .... equal 1 new pie, or $\frac{1}{2000}$ of £1.
2 new pies .... „ 1 new paisa, pice, or $\frac{1}{1000}$ of £1.
20 new pies, or 10 new pice ... „ 1 new anna, or $\frac{1}{100}$ of £1.
10 new annas .... „ 1 rupee, or $\frac{1}{10}$ of £1.
10 new rupees .... „ 1 new sovereign, 25 francs, or 5 dollars.

The following exhibits the scheme of the present British Indian monetary system:—

Rupees.	Anna.	Paisa, or pice.	Pie.
1	16	64	192
	1	4	12
		1	3

The following exhibits the proposed *new scheme*:—

New sovereign. (5 dollars international, or 25 francs.)	New rupee.	New anna.	New paisa, or pice.	New pie.
1	10	100	1000	2000
	1	10	100	200
		1	10	20
			1	2

Europe, and a low price of gold in India, were in fact correlative. The primary idea of a currency seems to be this:—We have in bullion a commodity known throughout the civilized world, and which can be carried at far less cost and risk than any other commodity, from any one country to another. Thus a certain weight, say of silver, can be exchanged for a certain quantity of goods, that same weight of silver can be exchanged in Europe for different quantities of the same goods. Its purchasing power, or the quantity of merchandise it will procure, vary indefinitely, but this fixed weight of bullion does, as a matter of fact, afford the best basis of comparison between the value of commodities in different regions. Trade, however, consists, for the most part, of the interchange of commodities, and where these are of the same aggregate, value there is no necessity for the transport of bullion one way or the other; but when trade shows large differences of value as between imports and exports, bullion is resorted to as the only means of adjusting the balance. There is less cost and risk in transferring bullion than anything else. Thus, speaking broadly, England paid India for her cotton by shipments of manufactured goods, as far as they could be taken, but when this means of payment proved inadequate silver was sent out, aud the demand, during the time of the war in America, being very urgent, the price of silver in England was much enhanced, and, for the same reason, the price of gold in India was depressed; for it was very much the same thing to the bankers, who carried on these operations, whether they paid more for the silver they bought, or got less for the gold which they received from Australia or elsewhere—the result was the same; the extreme quotations only serve to indicate a trade exceptionally stimulated or excited. But this large import of bullion was made to pay for cotton, and the cost of its introduction must be held to be paid for by the exporters of cotton; the whole matter being adjusted by operations, chiefly by bankers, in international exchange between the two countries, the question of the cost of transmission was settled within the limits of these operations, and the cost of transmission, of either silver or gold bullion, does not enhance their permanent value; and, in the case of the Indian standard, we must look still to the weight of the rupee, with no other addition than that for seignorage as the basis of the comparison between silver and gold. The best and safest way of arriving at equivalent in gold for the rupee was to go to the great markets in the world common to both. Owing to the difference between the English standards for the two metals, the figures required to show the exact calculation would be too lengthy to quote, and he would therefore simply give the prices as quoted for British standard silver and the equivalent in gold. Even taking 183·861 grains as the value, in silver bullion, of the rupee, it would require a price of over 5s. 3d. per ounce to make ten rupees equal to the sovereign, this price of 5s. 3d. of course referring not to the English silver shilling, which is merely a token, but representing the aliquot $\frac{63}{240}$ of a sovereign. But no one, in the face of the diminished demand for silver which must inevitably ensue on the introduction of gold on equal terms into the Indian currency, would venture to expect a higher rate than 5s. per ounce, or $\frac{60}{240}$ of a pound for British standard silver. A price a little over this would be required to make 10·8 rupees equal to the sovereign. As regards the probability of an advance in the price of silver, the probabilities were all the other way. The production of gold had been tested most fully—all the energy, skill, and enterprise of the European and American; all the patient assiduity of the Chinese, had been brought to bear on the fields of California, British Columbia, and Australia, yet these sources had yielded, since 1863, a diminishing supply, while the older mines of other countries showed some increase. The production of silver has been exposed to no such tests, though we know of large sources of supply, and also that quicksilver, which is a great requisite in its production, is the subject of great monopolies, which might, for aught we know, at any time be broken down. There seemed far more risk of a depreciation than of a rise in silver, and it would be most unsafe to put a high value upon it, in expectation of its becoming more scarce than at present. If a value of 10 rupees only were put on the sovereign, though no doubt any one would be glad to get the gold at the rate, no one would be found to give it; the option would be for payers to choose the means by which they could lawfully discharge their debts. The fairest equivalent of 10 rupees, taking all circumstances into consideration, was about 117 grains of gold, British standard; and if the sovereign (123·274 grains) were taken at all, 10 rupees 8 annas would be the nearest simple fraction at which it could be introduced with a fair chance of its remaining in the country, that is, silver at a little over 5s. per oz., British standard, and sovereigns 10 rs. 8 annas, will be found to be very nearly equivalents.

Mr. HYDE CLARKE said that, following the precedent of Mr. Hendriks in alternating an English view with an Indian one, he begged leave to make a few remarks, and he did so with greater confidence because he knew there were gentlemen present who had entered into the details of the subject, and who could correct him if wrong. He would not, like Mr. Hendriks, go into the political economy of the subject, but it did appear to him that the value of a coinage was affected by seignorage, and was regulated by the same influences which regulated other commodities. He did not, however, mean commodities which moved about so much as those which were stationary, like furniture, for instance. When we came to a different state of affairs, as international exchange, for example, then the coin became, like other commodities, of the value of the material, less the value of reducing that material to the useable condition. He took it that coin was fluctuating in its value, and that they were not justified in determining the value of a coin by solely limiting it to the value of the bullion. He made these remarks, because whether they took a standard of a decimal coinage for India really depended upon whether they could alter the coin without injury to the nation or injustice to the individual. If, on the other hand, they looked upon the coin as a fluctuating instrument, and as a fluctuating medium, then, he thought, they were justified in altering it. He could not agree with Mr. Hendriks with regard to a metrical coinage for India. What Mr. Hendriks said to them on the present occasion was rather an objection to than an argument in favour of his views. Mr. Hendriks had referred to the great advantages which would accrue from having a similar coinage to that of France and other countries where the decimal system existed; but so far as he (Mr. Clarke) could see, the relationship between India and France, and other countries, was an inferior consideration to the relations of India with Australia and England. He, however, said this with diffidence, because Mr. Hendriks had been a very active advocate of the system. He had read with great pleasure Mr. Hendriks' articles in the *Economist*, and still he must say that the more he heard from him the less he was convinced. With regard to getting rid of the anomalous arrangement of sixteen annas and twelve pies by substituting two hundred pies, why, that simply did away with the duodecimal system of an existing population to please a craving after decimals. It might seem all very well to alter to a decimal system, but he thought that the operations of a people were of much more importance to them than to the trade of other countries. He did not decry the value of any decimal system, but he could not see the advantage of introducing into India a decimal system which rested upon an artificial basis. In all these matters we should be governed, to a considerable extent, by practical considerations. Of course it was an object that, to some extent, there should be an uniform coinage in Australia and England; but they knew practically from experience that, where they had coins circulating from another country, there might be a great scarcity of that particular coin, while at another time there might be a flood of it, disturbing the whole arrangement of the market. He was sure that, if they had an international system, the bullion markets of the world would be subjected to far greater vicissitudes than those they suffered from at the present moment. They sometimes found, in great cities, that they had not really any money to carry out business operations, and that at another time they had a quantity of coin poured upon them, not for any purposes of commerce, but simply for bullion broking. He repeated that, to a certain extent, that was an objection to an international gold coinage in England and Australia. He was aware that an international coinage had some advantages, but, on the other hand, there would be no real advantage to India commensurate to making all the operations in our own markets the same as the markets of Europe. They must not forget that India was influenced by its near relations with Europe, and its coinage must become nearer and nearer to the coinage of Europe. The time was approaching, whether they liked it or not, when they must have a gold coinage in India. Remembering that, the objections that had been made to a gold currency seemed to him to have still less force. Mr. Hendriks spoke of the silver coinage in India. He would support what Mr. Hendriks said by referring to Europe. It was within the recollection of most of those present when nearly all Europe had a silver currency, and at present they nearly all had a gold one. Under these circumstances, India could not be kept out of it. The present debt of India might appear a very large amount, and it might appear of importance to give the gentlemen of the present day the same amount of gold that was stipulated years ago; but he did not think that was of any real importance; and, as to the amount itself, he considered it comparatively unimportant, because he considered it a very small proportion when compared with what would be required to develop the resources of the country.

Colonel **Smith** said that he must confess his inability to take up all the points which had been touched upon by the various speakers, they were so numerous, and all of importance. They were all very much indebted to Mr. Cassels for the valuable paper he had read before them, and he thought that it ought to have the effect of bringing the question to the notice of the proper authorities. As Mr. Cassels said, they had been too indifferent. Things were referred from India to England, and from England back again, as if they were shuttlecocks, and this would go on for ever, unless some steps were taken to prevent it. He hardly agreed with what Mr. Cassels had said upon the value of the standard he would introduce. He would go further than Mr. Cassels; he would say there should be a gold coinage for India of the value of ten rupees to the sovereign. He would undertake to prove to any three gentlemen who understood the subject, and who would have patience to listen to him, that the sovereign was worth little, if anything, more than ten rupees. There was one point he would like to mention before he proceeded to criticise Mr. Cassels' paper, and that was one upon which every merchant would agree with him, namely, that there should be as little fluctuation in the exchanges between England and India as possible. Great fluctuations, however, took place in the Indian exchange. They have had the rate sometimes at 2s. 2d. and at others 1s. 10d., that was, 16 per cent. He considered it a monstrous thing that exchanges should be allowed to show such great variations, when, by the adoption of a gold currency, they would not fluctuate above one per cent. He thought it a very great mistake to say that the sovereign was worth 10 rupees 4 annas—he considered it worth very little more than ten rupees; and if we had a telegraph to Australia, as we soon should have, it would not be worth that. He could show them why this telegraph would make a difference. He was not a commercial man himself, but he had been informed that bankers in London received telegrams telling them the price of gold in India, and that they replied by return telegram to sell. Gold was then sent out, at a cost of two per cent., while gold could be landed from Australia without that cost, or two per cent. cheaper. Gold could, in fact, be landed in Calcutta at the same cost as in London, and, consequently two per cent. cheaper than when sent from London. This may be explained as follows:—Gold coming from Australia to England, on its way for sale at £3 17s. 9d. per oz. standard, may, on its arrival at Galle, be said to pass the door of India, as it is within a week's distance of Calcutta or Bombay, and the freight and charges for that short distance must be less than the expensive and tedious transit through Egypt and the Mediterranean. Hence it is that the cost of gold in India is not more, but rather less, than the same delivered in London; and hence, too, if there were telegraphic communication between England and Australia, gold would be supplied at a cheaper rate than at present. There were three different methods of calculating the relative values of silver and gold in India. One method was, taking the price of silver and gold in the London market, and calculating all the expenses of landing them in India. That was one way. This method applied to the average of prices of silver in London for the fourteen years, from 1853 to 1866, gives the value of gold as $\frac{1}{3}$ per cent. more than the rate of ten rupees for the bullion contents of the sovereign.* The second method is, to calculate the value of gold in rupees from its power of purchasing bills on London, according to the rate of exchange. A banker or a merchant having gold in Australia had two courses open to him with regard to his gold. He might send it to London, and there sell it for £3 17s. 9d. per ounce, or he might send it to Calcutta to buy bills with it, and what he would get there depended upon the rate of exchange. A sovereign worth of gold would be sold in London for 240 pence, while if sent to Calcutta and exchanged for a six months' bill on London, this would take a month to transport to England, and the loss of interest for the month would be one-half per cent. There would also be, on average, two per cent. for discounting the bill. On 240 pence these charges would amount to sixpence, and, therefore, if the merchant could buy in Calcutta a six months' bill on London for 246 pence at the current rate, he would just be on the same footing as if he sent his gold in the first instance to London. Now, when the current rate is 2s. per rupee, his sovereign would cost him $\frac{246d.}{24d.}$ or ten rupees four annas. When the current rate of exchange for a six months' bill is 2s. 1d., the sovereign is fully paid for by 9 rupees, 13 annas, and 5 pies. Hence, it will be evident that the value of gold in India is precisely determined by the rate of exchange. For the last ten years that rate had been two shillings and nearly four-tenths of a penny per rupee, and that rate showed the value of the sovereign to be, on the average, about one per cent. more than ten rupees. There was a third method, and that was based upon the average price of gold as sold for rupees in the Indian markets. The result was similar when the averages are stated in due proportion to the quantities imported into India, and allowance made for brokerage. It showed the value of the sovereign to be very little, only about $\frac{1}{10}$ per cent. more than ten rupees. He thought that now was the time to introduce the sovereign as a legal tender. The effect of such a regulation would be that, as exchange rose, sovereigns would come in to India, and they would circulate throughout the country with the same purchasing power as 10 rupees. If, on the other hand, the present measures of the government of India were persevered in, and ten rupees and a quarter were exchanged for as much gold as is contained in one sovereign, it is evident the purchasing power of rupees would be 2½ per cent. less than on the first supposition; and, as the revenues of India amount to not far short of 50 millions sterling per annum, these measures involve a loss in the purchasing power of the revenue of about one million sterling per annum. That, he considered, was a serious thing. There was, however, one objection to introducing the sovereign at a high value, and that was, that the moment a turn of exchange took place, away would go the sovereigns, to be exported to England. That was true, certainly, but there was a remedy, and it was the only remedy, namely, stopping the silver coinage. There was one thing which one of the preceding speakers had said, upon which he wished to comment a little. That gentleman had said that his idea of a currency was the weight of gold, and that the comparative value of gold and silver ought to be reckoned with reference to the markets of Europe. This he thought a mistake. What we required to know, in order to establish an Indian gold currency, is the relative prices of gold and silver in India, not elsewhere. He was reminded of the argument of a friend of his, who said an ounce of gold was an ounce of gold, and then inferred that an ounce of gold in Europe was of the same value as an ounce of gold in Asia. He (Colonel Smith), however, did not agree with this inference. A ton of coals at Newcastle would be a ton of coals when it arrived in London, but there would be a considerable difference in its value compared with other commodities.

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* "Remarks on Gold Currency for India," page 35, par. 38. Published by Layton, and Co., 150, Fleet-street.

On the motion of Dr. Boycott, seconded by Dadabhai Narogi, Esq., the conference was adjourned to Friday evening, January 21st, 1870.

Sixth Ordinary Meeting.

Wednesday, December 22nd, 1869; Professor A. W. Williamson, F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Brown, Thomas, Grammar School, Grimston, King's Lynn.
Russell, John, Scotch School, New-road, Woolwich, S.E.
Witt, John Charles, Hamlet-road, Upper Norwood, S.E.
Worthington, James, Sale-house, Sale, near Manchester.

The following candidates were balloted for, and duly elected members of the Society:—

Bennett, Charles Fox, 55, Queen-square, Bristol.
Brand, Henry R., M.P., 70, Princes-gate, W.
Carter, C. R., 17, Carleton-road, Tufnell-park, N.
Farrant, R. E., The Limes, Lower Tulse-hill, S.W.
Greener, John Henry, 82, Lombard-street, E.C.
Hayne, C. Searle, 3, Eaton-square, S.W.
Hollebone, Frederick, Ravensbourne-park, Catford-bridge, Lewisham, S.E.
Langford, J. A., LL.D., Birmingham.

The Paper read was—

ON WINES, THEIR ORIGIN, NATURE, ANALYSIS, AND USES; WITH SPECIAL REFERENCE TO A NEW ALCOHOLIC DRINK MADE FROM TEA.

By J. L. W. Thudichum, Esq., M.D.

The Fable of the Asiatic Origin of the Vine—Wild and Fossil Vines.

Almost every treatise on wine or viticulture begins with the statement that the vine had been introduced into Europe from Asia. In this respect, the vine has shared the fate of many other cultivated plants, the origin of which was unknown to horticultural writers. The first error generally committed is the presumption that all varieties of vines which we know are derived from one primary species. Thereupon, the Asiatic paradise becomes at once unavoidable, and science and study are at an end.

Most botanical authors have fallen into the same error, and have assumed the existence of only one species of vine. The existence of wild vines they explained by the assumption of a degeneracy of cultivated species. Thus, in France and Germany, wild vines were generally declared relics of Roman settlements, and the very existence of vines themselves in those countries was ascribed to the Romans.

Gmelin, in his studies for the "Flora Badensis," observed that the wild vines frequently occurred in the dioic state. He described such plants botanically, and established a separate species for them, under the name of *Vitis sylvestris*. Those who copied Gmelin, destroyed the discovery by the addition that this was a degenerated *Vitis vinifera*.

This singular confusion of able botanists is the more astonishing, as the wild vines of southern countries, such as Italy and Spain, were well known to such authors as Crescentius, who lived in the thirteenth century, at Bologna, and to Clemente Roxas, a classical author on Spanish vines. The latter in particular declared the wild vines of Spain indigenous to that country, and to have consequently existed there long previous to the introduction or the origination of the cultivated species. His description of the vine thickets of Algaida, near San Lucar de Barameda, might be applied to the American fox-grape vines as found in the virgin forest.

The wild vines of the Rhine valley were first recognised in their true character by the late M. Bronner, an apothecary of Wiesloch, near Heidelberg. He studied them for years in the marshes, and then transplanted cuttings into his garden. In the autumn of 1866, I visited this vineyard, and was able at once to identify, from the description, several species. Leaves, fruit, and habit fell into the eye at once, particularly the barren varieties, and the varieties with inedible or very acid fruit were at once observed. The inflorescence of these wild vines shows three distinct forms. Some are males exclusively, and in place of the umbilicus, capable of fructification, have a small honey cup. These plants are usually covered with flowers, and perfume the air to great distances. They answer to the description which Pliny gives of the "oenanth." Other plants are hermaphrodite, like the cultivated vines; but the great majority of individuals as well as species of wild vines, is purely female, and the stamens are crippled and placed below the berry (*Stamina recurvata*). The American vines also occur in the polygamic as well as in the dioic state, and monographists do not admit this to be a characteristic feature, but hold it to be an accident to which any variety might be subject. However, in the department of the Ain, in France, is cultivated the "mescle." It has male and female plants only. The finger-leaved "mescle sterile" differs wonderfully to the eye from its female companion, the "mescle fertile." The vine-dressers know that they must have some of these "plantes craputs" in the vineyard, or they will get no fruit. They were as unable to explain the riddle as the French inspector of vineyards, M. Guyot, and talked superstitiously about it. I maintain that the dioic is the normal state of the mescle.

I count with Bronner twenty-eight species of wild vines of the Rhine. They are unlike any other known vines, unlike the cultivated varieties, and, in my opinion, are genuine children of the soil on which they stand, truly indigenous, and many perish when removed only a few miles from their natural habitation.

But suppose that my botanical argument were not recognised, then I would fall back upon the testimony of rocks. This proves that the wild vines existed in central Germany during the tertiary, and before the basaltic period. The specimens of coal which I have pleasure in laying before the meeting, come from the mine of Salzhausen, near Frankfort-on-the-Maine. The shaft by which the coals are reached passes through 180 feet of solid basalt rock. Who can guess the age of the jungle which produced this coal? Who can estimate the time which the phonolithic and basaltic mountains from which a stream flowed over the coals, required to be formed; or who can estimate the time which the biggest of them, the Mountain of Birds (2,200 feet above the sea) may have required only to get cool? Here they are, the leaves, barks, and kernels, of the *Vitis teutonica*. By these specimens, no less than by the wild vines of the present day, the fallacy of the Asiatic origin of the vine stands corrected.

In Upper and Lower Austria, particularly between Vienna and Pressburg, there grow many wild vines on the shores of the Danube. Jaquin, in an article in the Austrian "Annals of Agriculture," showed years ago that there were growing on the islands in the Danube large numbers of wild vines bearing small grapes. Similar vines appear below Buda, and extend to Transsylvania. The borders of the Theiss are enlivened by their presence. The Save, where it issues from Croatia, waters many plants of this kind. On the Adige, in the Tyrol, there are true jungles, formed by wild vines, which creep over low shrubs of *Rhus cotinus* and wild fig-trees. In the valley from Meran to Roveredo and Trient, there are no wild vines whatever, but they appear where the Adige leaves the mountains, and runs through a low, marshy country.

From the foregoing, it is evident that all those European countries which possess the climatic conditions, have in their flora many species of the genus *Vitis* in a wild state, with such botanical characters as leave no doubt that the plants are indigenous, produced by natural selection, and not derived from imported cultivated races of vines, or degenerated by natural selection from previously cultivated races, the products of artificial crossing or human selection.

Probable Derivation of Cultivated Vines from Indigenous Varieties.

Each particular district producing a particular kind of well-characterised wine, does so by means of particular well-characterised varieties of vines. These vines, I now maintain, must be either indigenous to these districts, or be produced in them by natural or artificial selection from indigenous varieties; for, when transplanted to other districts, they change their character more or less, so as to produce a different wine, or they lose their peculiarities so completely as to be worthless for making wine, or they cease to be fructiferous, or, lastly, they do not succeed at all, and pine and die out.

The Aramont is commonly grown about Montpellier, on account of its extraordinary fertility. Its bunches are large, its grapes of the size of nuts. Transplanted to the south of Germany, the aramont begins to bear in the fourth year, and brings large and many grapes. But, year by year, its fertility decreases, and its berries become smaller, until the viticulturist is obliged to remove the barren plant.

Austria possesses four peculiar vines, which are probably indigenous to the banks of the Danube. They are the following:—

The Rothgipfler, of Upper Austria, a vine with very dark foliage, the ribs, nerves, and points of which are red. At first sight, it resembles the "Traminer," but its grapes are green.

The green Muscateller of Upper Austria is one of the most fertile vines in existence; its bunches are large, and bear small greenish yellow grapes. It is not cultivated in other parts of Austria.

The white one of Grinzing, a village near Vienna, is only met with in the country around Vienna, where it is cultivated after the head-knob fashion.

The red Zierifandler, of Vöslau, is cultivated only in the valley between Vienna and Baden, and not to any great extent. Its grape is light red, and is said to yield good wine. Bronner planted these four varieties in his vineyard at Wiesloch. During ten years he did not obtain a single grape from any of them, and after ten further years all the vines had died out.

The vines of Europe transplanted to North America do not succeed. Viticulture in that country is only possible with indigenous varieties or their crosses. On the other hand, American vines, which yield good wine in the United States, when grown in the Gironde, degenerate, and yield no drinkable wine. M. Boucherot, of Carbonnieux, near Bordeaux, has made this experience by plantations on a large scale, and it is from himself *in loco* that I have ascertained the circumstance. The varieties were fox-grape, Isabella, Catawba, Schuylkill or Alexander, Bland's, Ohio or "cigar-box," the two varieties of the summer grape, the Mexican mustang grape, the winter grape, Scuppernong, and mountain. I abstain from giving more exact botanical names and diagnoses, which I made in the Botanical Garden at Bordeaux, to economise space.

It is said that "Bucellas" is made from the "hock" grape, transplanted to Portugal. The "hock grape" which could be called by that name must be the Riessling. But nobody would recognise "Riessling" in "Bucellas," which proves that the vine so alters its character in the southern climate as to give an altogether different product. Sherry is, to a large extent, made from a grape called the Pedro Ximenes, said to have been brought to Spain from the banks of the Moselle by the man whose name it bears. If this be as related (and in view of the fact that the nature of the Xeres vines is not satisfactorily determined, I reserve my judgment), this vine could only be the "Albuelis" of the Romans, or "Elbling" (Elbe) of the Germans. In sherry this ingredient can be as little recognised as any sherry flavour can be discovered in moselle.

The vines of the Alto Douro differ in specific botanica character from all other vines, as port-wine differs from other wines. The Gironde produces the peculiar red wines by means of its "carmenet," "carmenère," its "malbec" and "verdot." Transplanted to Spain, these vines do not produce clarets any longer. In a climate less warm and less moist these vines so lose their fertility as to cease to be remunerative instruments of agriculture.

By these selected few examples out of many at hand, I intend to illustrate the following proposition:—Every uniform climatic region has its peculiarly-adapted varieties of wild and cultivated or cultivable vines, which cannot be so successfully cultivated in other regions, or cannot be cultivated at all anywhere else. But many varieties of vines, generally those of no particular qualities for wine-making, can be grown in a variety of districts, although in that case even, it is necessary that these districts should have some climatic features in common.

Now, as wines are everywhere rising in price, and will continue to do so, and as prices stimulate production, viticulture will no doubt experience great expansion in many parts of the world. This will mainly take place in new districts, for the old districts hardly admit of it. The viticulturists will have to find the suitable vines, particularly wild varieties, if there are any, and to plant, to graft, and to cross, and rear seedlings. New countries, therefore, must produce new vines and new wines, and should not endeavour to imitate any special product of the old world. I say this with reference to the efforts now making in Australia, Peru, California, and Virginia to cultivate vines on a large scale.

Modes of Cultivation of Vines.

We are an agricultural Society, and take notice of subjects and matters which may be applicable near home or in the remotest parts of the world. We evolve or discuss what others may employ elsewhere; but we are also interested more directly in having certain knowledge of the manner in which the wines we drink are produced, or ought to be produced. My remarks on this subject will be based on personal experience and study abroad; they have the same object as the rest of my paper, namely, to contribute my share of agitation to produce for our population more, better, and cheaper wine, and to teach them how to produce, husband, and drink it.

Vineyards are planted in disorder, "quincunx," or in rows, *i.e.* lines. It is necessary to give to the sun the utmost opportunity for warming the soil, and, therefore, a rational viticulturist draws his lines parallel to the meridian, wherever other considerations do not determine a different course. As animal labour and machines are everywhere, in a measure, taking the place of human labour, the planting of vines in lines becomes more prevalent. The scientific reporter to the French government, M. Guyot, thinks that the future of viticulture belongs to the arm, as he expresses it, and that hand-labour will outdo animal labour. But what I have seen of French viticulture in particular, and heard of successful viticulturists, is all to the contrary effect. Certainly viticulture on a large scale requires the plough and horse, and the intermittent nature of the occupation forbids the accumulation of hands. In new countries labour would be naturally scarce, and therefore Australia and America should so arrange new plantations as to make them accessible to the plough. In Croatia, splendid vintages might be produced if the plough were more commonly used. Certainly such vineyards as Banyoul-sur-Mer, the rocky ridges of the Rhine, inclines like Johannisberg, and thousands of hanging mountain-sides will always require the hoe. The viticulture of the Champagne is, at present, disorder, and does not admit of animal labour. But the vine of the future will, like the great mass of the wine of the Gironde of the present day, be grown on soil ploughed by oxen or horses; and when enterprise and capital shall have everywhere made such rapid strides in the prosecution of a rational viticulture, as I have lately witnessed in the Gironde, the steam plough will do the tillage, and mineral sources will furnish the manure.

Vines are dressed according to certain types, of which I have observed about twenty. Many of these are merely traditional, and cannot be defended on any grounds, at least when the object is to produce grapes fit for wine-making. The grapes should everywhere be kept as near to the ground as possible, but out of the reach of the splashing earth, in order that they may be nearest to the heat radiation of the soil, and least exposed to cold winds. See how closely the viticulture of the Rhine, of the Champagne, of the Médoc, of Burgundy, Maconnais, of parts of Hungary, comes up to the ideal in this respect. These produce natural wines, requiring no spirit. But, wherever the grapes are allowed to rise higher above the ground, as in the South of France, or in parts of Spain, or where they are grown high in the air, as in Tyrol, in Croatia, most parts of Italy, in the Pyrenées, wine has to be simmered, or to be alcoholised, in order to impart keeping qualities to it. But the result is worse, for Italy, for example, owes the decadence of her production and exportation of wine to this erroneous viticulture. If she adopted generally the rational method, she could at once supply great quantities of good wine, and export, while now Italy (Sicily excepted) imports wine.

The several methods of cultivating the vine are best illustrated by views of the vines in spring, after they are cut, and before they have grown any branches; and, again, by their appearance at the time of the vintage. The following are the principal types:—

General Method.—Cultivation in low lines.

Médoc Cultivation.—Smallest development of permanent trunk; lowest lines practised.

Palus Cultivation.—Higher trunks. Intended for bearing quantity. Enormous growth and great harvests of this cultivation.

Graves or Sauterne Cultivation.—Grapes kept higher, to prevent rotting.

Côte-d'Or.—Disorder; lines.

Champagne.—Disorder. The vines are pruned every third year, consequently the vineyards always bear a youthful aspect.

Kammerbau.—Alsatia and Palatinate. Good for quantity; too shady and high for quality, except in hot seasons.

Rhenish Cultivation.—Low basket or bent rod.

Tier Cultivation of Moselle.—Now disappearing. Yields sour wine, but much quantity.

Hedge Vineyards.—On the Loire, in Hungary, the Nahe valley. Vines growing on shrubs like brambles. Suited for new countries. Require cutting only; no other cultivation. I have seen thousands of acres of vines, all lying on the ground, on rocks, stones, grass, and shrubs.

I do not consider the methods of growing grapes for eating, such as I saw in beautiful perfection at Thoméry, or such as are practised with so much success in our English vineries. I believe that, for the production of wine, the Médoc, Palus, and Rhenish cultivation meets all requirements, but their advantages seem united in the general method; this I have seen practised in the Palus and the Graves with similar success, and in Burgundy with much increase of produce.

With suitable vines, the general method might be practised in all parts of Central India. Where coffee and tea grow, wine will grow, and the whole of Central India is within the viticultural zone. The sea-board, and a belt of 200 miles all round Hindostan, are not suited for viticulture. Railways will remove the question of transport. Then India may send us wine in exchange for the thousands of barrels of beer which she consumes. The proposition of viticulture in India might perhaps be more closely considered in one of the Society's Indian Conferences.

Necessity of a New Study of the Fruit of Vines, with reference to their Capabilities for Vinification.

The Chaptal collection of vines at Paris was intended partly to meet this want. With the one man passed away the comprehension of the problem, and the Jardin du Luxembourg now contains only the ruins of a great idea. According to my collations, the upwards of 2,000 numbers of the Chaptal collection are reducible to less than 500 distinct varieties. These, in my opinion, contain the elements of much progress in viticulture, but the progress can only be made by the hand of science.

The different and the relative qualities of the various vines, as regards the quantity of sugar, tannin, acids, salts, colouring matter, essential oil and bouquet contained in their grapes, have never been studied. This study has only been initiated by Dr. A. Dupré and myself, with regard to some of the finest grapes of the Rhine valley, and soon after we observed, with great satisfaction, a similar study begun by M. Pasteur. Progress in vinification means much besides the improvement of bad harvests; a barrique of Chateau Margaux may be worth £5 in one year, and £80 the next year. The bad wine is prepared for the consumer by the process of "mettre dessus;" and, in fact, good wine maintains its price mainly as a drug for ameliorating much bad wine, but a scientific treatment of the £5 Chateau Margaux, while must, might avoid all subsequent mixing, and produce a much better product than the "mettre dessus." Cheap wines are too often incongruous mixtures of common growths, to which a nose has been turned by addition; they succeed if drunk within the fortnight. Now they might very well stand upon their own merit if their must had been properly treated; and this treatment of the must is the next improvement required in either chateaux or peasants' chais, in Rhenish cellars, or Spanish bodegas. Wine, which like that made in the Jura, contains from 12 to 18 per mille of acid, is undrinkable unless mixed with water; consequently, vines which yield permanently such must ought not to be cultivated; or, if their value as plants of cultivation is clearly established on particular grounds, then their must has to be treated so as to reduce the quantity of acid to the normal. Similarly, the alcohol of wines has to be kept near the normal. If chasselas yields wine with 2 to 3 per cent.; gamais, 5 to 7 per cent.; pineau, 10 to 14 per cent., it is clear that pineau must always be the most valuable wine, all else being equal. The little pineau which is grown is most used for falsifying gamais wine, and Burgundy is fast becoming a tradition. This deplorable fusion must be counteracted by progress in the treatment of gamais must and chasselas must, and pineau fermentation. If not, the Bourgogne is certain to lose its reputation. Common wines will never pay the agriculturist, or succeed as articles of trade, unless they are produced as scientifically, cleanly, and uniformly as beer; and this can only be done by the aid of the scientific chemist.

It has hitherto been assumed by agriculturists that the grapes, while unripe, accumulated acid, which during ripening was converted into sugar. But it is found that during ripening the acid, in 100 berries, either actually increases or remains stationary, while sugar rises from 2·6 parts to 19·8 parts. In fact, each variety of grape has it own laws in this respect, which differ greatly from the laws of almost every other. Grapes have to be considered as physiological individuals, and not their must as a liquid changing only in per-centic composition. It is the latter error which has led to so much fallacy.

The "Enfariné," English "black cluster," is a vine of the Jura; its fruit is the most acid and least sweet. In September its grapes contain from 23 to 25 per mille of acid, and from 154 to 160 per mille of sugar. At one period the unripe grapes contain less acid than the ripe ones. At a certain moment of maturation (when they become black), if not during the whole period of ripening, the amount of acid increases instead of diminishing, as has hitherto been supposed to be the rule for all fruit. Sometimes the sugar is found to diminish during ripening, and the disproportion differs in succeeding years.

The "Ploussard" is also a vine of the Jura, and yields delicate wines. When passing from green to red and black, its grapes simply take up sugar. When ripening more, its acid is diminished, but not in proportion to the increase of sugar.

In southern countries the grapes are mostly gathered at the time of greatest volume. This is the main reason of the little keeping powers of southern wines, and of the necessity of brandying. In the Sauterne, grapes are collected at from eight to eleven different periods, and berries are cut off singly, illustrating the extreme of expensive care. On the Rhine, the Riessling is gathered at the latest possible period, and allowed to rot, if possible, provided that the rot is what is called "sweet rot." This is correct for the Riessling, and it has taken hundreds of years to teach the principle to the people at large.

But although the must in southern countries is not treated as science would suggest, it is not, for that, left untreated, for Spanish, Portuguese, and French wines of the south are plastered, that is to say, plaster of Paris is dusted over the grapes immediately after they are gathered, or while they are on the press, or while they are in the state of must. Dr. Dupré and myself have been unable to find out the logic of that practice. If it is intended to make the wine stronger, it fails; for plaster unites with little more than one-fourth its weight of water, but the gypsum formed incloses mechanically a quantity of must, and reduces the total yield, so that 50 per cent. of plaster will retain fully half the juice, and raise the sugar in the remaining half from 13 to 15 per cent. only, and lesser quantities in proportion. But plaster will diminish the free acid of the wine, in proportion to its quantity, from 5 to 0·5 per mille. It will do more; it will decompose the tartrates, and form sulphates, and thus change wines into drugs. In fact, all sherries contain considerable quantities of sulphate of potassium, to which many varieties owe their bitter taste and their purgative action. I am quite open to instruction on the use of plastering, but have sought it in vain of some large producers or importers of sherry. No doubt the 20 per cent. of alcohol in sherry is a frequent cause of kidney affection, but the cause is at least doubled by the potassium salt. I vote for sherry without plaster acid, and less than 16 per cent. of alcohol; such sherry will require neither camomile nor nitric ether for a flavour. I vote for not changing ripe must into unripe by removing wine-acid, and leaving sour apple acid. I delight in a glass of Amontillado, or even cheap "vino de arenas," but I gladly leave the drink of tincture of Glauber's salts to the old gentlemen who, as the phrase goes, "cannot get anything dry enough."

Vinification.—Rational cleanliness is greatest in the Champagne. I have there seen press-houses clean and neat, like drawing-rooms, particularly those of the greatest houses. Some I have seen in cynical dirt. But generally in vintage time, in the Champagne, everything is brushed up, from the thousands of donkeys which carry the harvest, to the wandering crowds which gather it, to the sedate matrons who clean each bunch, and invite you to buy in daylight. In the result, the champagne maker turns even a very common wine into a delicate drink, and sells it at a very large profit. Uninterrupted rises the consumption and production of effervescent wine, because the motto of its life is "Care." A recent notice in the *Daily News* stated that the Champagne exported from Rheims alone has increased within a short time from three to nine million bottles. The whole of the Champagne districts produces about thirty-five millions of bottles. It does not turn bitter or sour, and, though it has vicissitudes, they are trifling compared to those of its brother Burgundy. Burgundy is made from the same pineau, but fermented with the husks. Bitterness, greasiness, or viscidity, fall of colour, persecute it; the English excise law had to be changed to enable this wine to be imported in bottles, because it would not stand transport in casks. If you seek for causes, go and see vinification in Burgundy. Feet in and out of boots, in and out of vats, alternating from boots to vats, and vats to boots; naked men up to their necks in vats of what might have become delicate wine, doing the "foulage," and almost dying over it, rotten "chapeaus" not removed, yielding the rotten egg flavour, which some profess to believe to be the sign of genuineness of Burgundy wine. No wonder, I thought, when I beheld such things, that Burgundy lacks qualities, or has too many; and I wondered still less when I had seen the people and their houses, villages, and hotels. Why do not they learn from their clean brothers in the Champagne? More cleanliness and less bluster about the generous qualities of their wine would bring them farther. I feel this all the stronger, as I believe genuine wine of pure pineau to be an unmatched treasure, an antidote to melancholy, of which a draught goes to the heart directly. But your gamais gives me morbid palpitation, from its butylic and valeric alcohol. Anyhow, I call to all who sell wines to us, the public, if we must drink gamais, tell us that it is so, and if we can have but little pineau from Macon, let us have that little pure. But always let us know what is wine from pineau, or wine from gamais, or what is mixed, and in what proportion.

On the Rhine, vinification is extremely clean and deliberately done, and the wines are, therefore, generally of clean and even taste. In the Gironde, vinification differs much, but all red wines are produced in the most simple manner. The large quantities of common red wine have been in contact with much dirt, and the makers always consoled me about this dirt by saying that it would be taken out by fermentation. I am certain that such dirt would not be allowed in any brewery, and had better be avoided in the chais as well.

The Champagne has the most splendid cellars (caves) which could be made, and these maintain the evenness of its product. But the rest of France has no cellars, and no means of controlling fermentation; vinification is there performed in sheds above ground. This want is the main reason why so much wine is tainted with acetous fermentation. If Languedoc had caves, its wines could be made so as to beat any others for drinking purposes; we now get them dosed with Gironde astringency, under the name of cheap claret; the same with Roussillon. The want of cellars in Spain is a principal reason why natural or unfalsified wines cannot be produced there. Such wines require slow fermentation, and that can only be attained in low temperatures. This same want of cellars it is perfectly astonishing to behold in a town like London. Thousands of barrels of beer (particularly stout) are annually spoiled in the warm so-called cellars of public-houses, after having received the first acetic crack in the large sand-covered, heat-exposed vats of the large brewers. Query—What connection has acetous, acetonic, and eely beer with epidemic diarrhœa? Could it be prevented by cool cellars, and keeping the oxygen out of the barrels? I maintain that much of it could so be prevented.

Origin of Wines as to Species of Vines from which they are Made, and Places from which they come to be better defined.

In a book on geography for schools, which was put into the hands of some of my children to learn from, occur the questions—"Where is Germany situated? *A.* Between Austria and Prussia. *Q.* What is Germany remarkable for? *A.* Because hock grows there, and the glutton lives upon trees. *Q.* Where does hock grow? *A.* At Hockstadt, in Suabia." The interrogatory style of the catechism then changes to the commanding—"Describe the glutton!" The respondent does so at length, and one only regrets that he was ignorant of the manner in which the glutton cures himself of the effects of his habitual surfeits. I recommend the book (and similar productions by an Oxford graduate, under the title of "Stepping Stone," containing almost the same questions and answers), said to be composed by a lady, and stated to have passed through a fabulous number of editions, to the attention of the educational societies. My object here must be limited to the reality about hock. Hock, in this country, means Rhine wine in general. The word is an abbreviation of "hochheimer." This wine grows upon the banks of the Maine, but its character is that of Rhenish wine. But, then, Rhine wines ought to be distinguished from each other, according to the principles of the above title. The Riessling wine yields the most bouquetted wine, typical of grand things, such as Steinberg, Johannisberg, and, in general, the fine wines of the Rhine-gau are made from the Riessling. But the Rüdesheimer of repute, the Feuerberg, and a few others, are produced from the Orleans grape. The wine of the latter differs from Riessling as Sauterne from Pouilly or Chablis. A third predominant vine is the Traminer,[*] much grown in the best parts of the Palatinate; and, as regards the wine from this vine, all producers are proud to sell it as such. A fourth vine is the Sylvaner, which has the greatest expansion, and, with the Riessling, yields the great bulk of medium-quality Rhenish wines. Now, traminer wine has a slight peculiar bouquet, and sylvaner still less, but the latter is spirituous and fine. The red wines of Ingelheim and Assmannshausen are made from the red Burgundy or pineau grape exclusively, but differ somewhat from Burgundy wine. Now, if all these differences in Rhine wine were maintained and stated, I venture to say that the interest and pleasure of the consumer would be much greater, and the merchants much more successful.

The red wine of Vöslau and Gumpoldskirchen, near Baden, about fifteen English miles from Vienna, comes from a particular black grape, called "the early blue Portuguese." This is an early-ripening, very sweet grape, of somewhat larger size than the Burgundy pineau. When properly matured, it is bluish-black, good to eat, and gives a wine of dark colour. Its Portuguese origin is not proved. Its extensive plantation in Austria was a great success, because but little red wine is made in other parts of the empire. The wines are much sought after and well paid, mainly because they are mild and mature for drinking within a year or two, while most other Austrian wines require from six to ten years of cellar before they are drinkable. From Vöslau the vine has been imported into Würtemberg, and vast quantities of red wine are there annually grown by means of it; this wine is also smooth to the taste, through the absence of tannin and excess of acid. When travelling in the Tyrol last autumn, with my friend Professor Carrière, of Munich, we had to abandon Tyrolese "schilcher" as too acid, red pineau from Botzen as unsound, *i.e.*, frisky, and our enjoyment was Vöslauer, which was sound, mild, almost fine, and cost but 1s. 8d. the quart bottle.

Croatia is particularly favourable to viticulture; there the large-berried vines thrive—the "blue cinnamon vine," "red Portuguese," "Grünhainer," "Heunisch;" also the white "Welschriessling," and "moslavina," or "furmint" (Tokay grape), are grown there. The latter will never yield good wine without much chemical treatment of the must. The same applies to Hungarian wines. The sweet Tokays will not have much demand in this country or in Germany, and the dry Tokays, which might have a great sale, are at present too acid. This applies to wines of good years—which have been from 10 to 15 years in cask; how much more would it be true of these wines in the third year. It is stated on good authority that the Hungarian wines now being sold could never have paid for cellarage; we must wonder, therefore, why the large landowners keep such "white elephants," or grow any vines at all. Perhaps most of them are tithe-wines of lords and convents; but, whatever they are, they can never be objects of that trade which it once was hoped would rise up for Hungary. The producers must plant and produce better vines; they must treat their must so as to depress acidity, and raise alcoholicity; they must cut out the faults which are termed earthiness; then the intermediate traders, who keep the wines in cellars for years, must rack it at least once a year, and not leave it upon the lees, even the first lees, as is now commonly done, for years. Only thus can the Hungarians hope to obtain that trade in wine with Germany and this country which the viticultural capabilities of their country invite them to hope for.

While the viticulture of Croatia resembles that of Hungary, that of Dalmatia is almost entirely Italian. Dark astringent wines are grown there. But one Hungarian vine is the blue Kadarka, and a white grape is the Orleans of the Rhine Valley. It is very curious that in the whole of Europe there are only two places where the white Orleans grape will grow. The Dalmatian wines go to Italy, Turkey, Thessaly, and Epirus. If they were not made in deal vessels, and had fewer faults, they might become objects of a much more extensive trade.

I should like to speak of Istrian Piccolo, or "hansel," of bower and chamber cultivation, but Istria reflects all Italy. The wine is a subsidiary crop. The blue refosco and and the malvoisie grape, and twenty other varieties, are unable to sustain their ancient reputation when grown high in the air. The lowest wine retailer in Germany or France would refuse to sell such stuff as is sold in some of the first hotels in Trieste, under the name of Istrian wine, particularly "refosco." And yet Trieste is a one-sided port, having more import than export, and its shipping would be glad to take good wine to many parts of the world.

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[*] The traminer, supposed to come from Tramin, in the Tyrol, does not grow there, nor within fifty miles round: I maintain it to be indigenous to the Rhine-valley.

The effervescent wine from the "Ribola" grape of Görtz deserves mention, as a subject for future enterprise. Like the Riessling wine of Botzen, its manufacture is in its infancy, but the quality of the material and of the grapes are all that can be wished. In the Tyrol, viticulture has hitherto been bad, because southern large grapes were grown, particularly the Vernasco, or Vernatsche, *i.e.*, the red Frontignan muscatel. There, however, is at home that celebrated, and to all growers in hot-houses or vineries, and particularly therefore to English viticulturists, most important vine, which they know under the name of black Hambro', whose true German name, however, is, from its evident fatherland, the "Tyrolinger," or "Trollinger." The French, who received it from the Palatinate, call it Frankenthal. This is, after the Chasselas, of all eating grapes the most perfect, on account of its having thin husks, small pips, tolerably solid, yet juicy flesh, and an agreeable acidity, never in excess, mixed with a sufficient amount of sugar and mild flavour. The bunches are never very large, and not so close that the grapes have not sufficient space to develop themselves. The vine is always fruitful, and even in bad years may be used though not completely ripe, on account of the moderate amount of acidity. When the grape gets ripe, and is allowed to hang a little beyond the period of its greatest volume, it yields a splendid wine. I should like to see this vine more commonly used for wine in warmer climates. There are two celebrated vines of this variety —one in a greenhouse in Hampton-court-gardens, and one in the hot-house at Windsor Castle. These should be visited towards autumn by anyone who wants to see the fertility of this vine.

Tyrol produces the finest fruit for eating. The white Rosemary apples are bought by the Russian traders at a shilling a piece. Its grapes are eaten by hundreds of sick persons, who flock there to use the so-called grape cure; but they are eaten too early. Meran, a climatic place of great reputation in Germany, is also the principal grape-cure place. But I think that, if this practice is to be maintained and extended, so as to develop its full benefits, a much greater variety and better selection of grapes must be obtainable at Meran from July to October, and they must be given in the fully ripe state.

Analysis of Wines.

It was my intention to add a few remarks on the analysis of wine, and these I must make extempore, not having had time to commit them to writing. The analysis of wine in this country requires a new standard, particularly as to its alcohol. We are in the habit of referring all measures of alcohol to a certain standard, which is called proof spirit. In that respect we differ from all other nations. This is highly inconvenient, and therefore I should propose, and I shall propose hereafter in a more extended form, that the standard of alcohol in this country should be made the same as it is in France and other countries, viz., the simple per-centage of absolute alcohol, measured by weight in volume, so that we shall hereafter speak of wine containing 10, 12, 15, or 20 per cent. of absolute alcohol, and not so much proof spirit, because that is an expression which does not at once, and without calculation, enable us to compare wines in this country with the wines we get from abroad; and the same applies to brandies and other spirituous liquors. This will involve a still further simplification, namely, that all instruments for measuring the strength of alcohol in different liquids, used by scientific men, the excise, and persons in the trade (alcoholimeters) shall be made centigrade, so that we may know at once what is the amount of absolute alcohol present in any liquid we experiment upon. The analysis of wine has been carried to the greatest perfection by my friend Dr. Dupré, who can tell you more about it than I can myself, and I hope you will presently have an opportunity of hearing from him some of the results he has arrived at. It appears that hitherto the analysis of wines has been too much of what I may call a *sycophantic* character; that is, its object has always been to find out whether wine was falsified and mixed, or whether it was natural. But these are really not the principal chemical questions; these are, what is the real nature and intrinsic composition of wine, and that, I think, has been pretty far advanced by Dr. Dupré. Thus, for example, it appears that wine may contain a great variety of ethers, amounting in some cases to twenty-five in number or more; that as wine ripens, it is found to contain more of these ethers, until it reaches a certain maximum, and that after that it falls off again, and the ethers decrease in quantity. So that we have a chemical confirmation of the judgment of the nose. Further, chemical analysis has taught us not to practise any error in the making of wine such as I have already referred to in the case of sherry. Sherry is treated with plaster of Paris; if we could learn the reason, and discover that it was a good practice, by all means let sherry be plastered, and let us find means to neutralise the effect of the sulphate of potash which results. But if, on the other hand, there is no good reason for plastering sherry, let us abandon it. Let us consult scientific chemists on the subject, as is done by the French government, which will not allow plastered wines to be supplied to its fleet or army, because it is advised they are injurious. There have been other supposed discoveries with regard to wines, particularly the Hungarian wines, showing that they contain certain phosphates and a little iron, but these are things of no great value; they vary considerably, and phosphatic food is sufficiently represented in what we eat daily; besides which, one small glass of beer contains as much phosphate as a bottle of wine, so that if anyone should require a phosphatic food he may drink beer.

Much has been said on the question whether or no we ought to drink fortified wines, *i.e.*, those to which brandy has been added. I consider that to be an unpractical question, for I think the judgment of this country on that point is perfectly settled. Since the new treaty of commerce with France, and the reduction of wine duties, the introduction of wines has no doubt increased to a certain extent, but the consumption of natural or unbrandied wine has not increased to the same extent as that of strong or brandied wines has, particularly the so-called sherries. How are we to explain that? I think the late Mr. Tennant, who wrote a very elaborate work against the reduction of the wine duties, was right on that subject. He said:—"You want to reduce the wine duties in order that natural wines may be imported, but I tell you these natural wines are of such a quality, that if you bring them here the English will not drink them." That is really the fact, and compared with the excellent quality and low price of beer of this country, the common wines of other countries cannot stand. Therefore, if in this country, where every man on the average drinks about three bottles of wine a year, we want him to drink a hundred bottles, we can only tempt him to do so by giving him a better drink.

Now, this can only be obtained from the natural materials by the aid of the scientific chemist; it cannot be done by any other machinery. I should say, therefore, if capital were embarked in that branch of industry, particularly in the south of France, in Languedoc, in the same manner as it has already been employed in the making of better sherry, I have no doubt that, with the guidance of persons acquainted with the English taste, the manufacture and importation of new wines might be greatly increased, and the consumption of wine in this country might conduce to the benefit of the population. A few days ago, I happened to be placed between an Englishman and a Scotchman, the latter of whom said the English drank too much beer, which made them stupid, while the Englishman retorted that the Scotch drank too much whisky, which made them wild. I think a slight change in the quality of their drink might benefit both parties. If both the Englishman and the Scotchman had a little wine now and then, the evil effects which they so graphically described would be entirely avoided. Moreover, there is in wine great medical power, and that power belongs more particularly to natural wines—less to the sugared and brandied wines; and there can be no doubt that, in the progress of the world, natural dry wines will carry the day over the brandied wines. I should say, therefore, the wine hereafter to be prepared for this country should be made dry, clean, good, and cheap. That sort of wine could be made in enormous quantities in Languedoc, where there are nearly 300,000 hectares of land in one uninterrupted stretch, covered with magnificent grapes. In fact, we do drink a good deal of these wines now, only we do not know it. We get them from Bordeaux, where they are mixed and blended, and come to us under the name of the exporting harbour. What we want is the Languedoc wine, and the wine of each country under its own name, and particularly that each should be made on scientific principles, and then we shall be much better off than we are at present.

As to the mode of drinking wine, which I have alluded to in the title, I can only say a few words. I should recommend, as a physician, that the practice of drinking wine be changed a little more than it has been. Fifteen years ago, when I was in the habit of going to a good many dinners, I found nothing but very strong wines, containing always at least 20 per cent. of absolute alcohol; and men after dinner used generally to look rather uncomfortable, with heavy heads and small eyes, and appearing just able to hold their coffee cups. I have seen a great change since the treaty of commerce with France. Now, on going to a dinner, I see the table covered with nothing but light wines, white Burgundies, and particularly light clarets, so called; these every body drinks, and if there is a bottle of sherry here and there it is rarely touched. But there is one practice still maintained, although it is beginning to be abandoned, and the sooner it is so the better. We begin with light wines, then go to champagne, and generally wind up at dessert with an awful array of heavy bottles; and, to me at any rate, it is decidedly uncomfortable to be continually called upon to pass the bottle. I see also that a great many persons do not drink these wines, which are constantly put before them, but take only claret. I should recommend, therefore, that we adopt the French habit, of having on our tables not more than three wines altogether. One clean, good, sound, substantial wine, to drink to quench our thirst and take with our food; next, a good, fine, delicate wine, say Burgundy or Medoc, or champagne, or both, to particularly please our palate; and, for dessert, nothing but good port, in small glasses, and good mild claret. I think, if we confined ourselves to that, and did not drink so much heavy wine, we should be much better.

New Alcoholic Drink from Tea.

Now, in conclusion, I must say a word about the long array of bottles you see before you, which contain a variety of new liquids. They were made at the instance of a friend of mine, Mr. Adam Scott, who has been long connected with China. Some time ago, there was a great depression in the tea trade; an enormous amount of tea was accumulating in the London docks, and the merchants did not know what to do with it. I said I would try and see whether some drink could not be made from it; and Mr. Scott sent me several varieties of tea, such as Congou, orange flavoured Pekoe, Kaisow, Oolong, and a variety of other fine teas. They were tried one after the other. Decoctions were made, sugar was added, and a certain amount of yeast, and fermentation began. By adding more or less of one or the other—more tea, more sugar, or different kinds of sugar—we were ultimately successful in producing what you see before you, six varieties of wine, which are open to inspection and taste. Nos. 3 and 4 are natural tea wine, with nothing added but sugar, and the yeast to ferment the tea, the samples before you being about a year old. There are two varieties, one being made from orange Pekoe, and the other from Congou, flavoured with Oolong. Each gallon contains the extract from ½ lb. of tea. Nos. 3*a* and 4*a* have had a little alcohol added, and whereas the natural wine contains 9 per cent. of alcohol, these contain about 11 per cent. This was done to suit the taste of some persons who thought the other was not strong enough. Then, again, others said, this is too dry; it is a very good stomachic, but I like something sweeter. We therefore added two to four per cent. more sugar, and four per cent. more alcohol, and that gives you a wine which is six per cent. below strong sherry. Then I have made a different kind again, in another manner. I have taken natural wine, which itself was worth nothing, and could not be drunk, because it was fermentescent, and mixed with that a certain quantity of tea, whereby the whole fermentability of the wine was at once destroyed; then I added acid and alcohol up to 9 per cent., the acid being 4 per mille, and a little colour, and the products of that process are Nos. 5 and 6. Then, last, I tried an experiment which I myself consider the most successful of any. I made an effervescing wine in two ways. First in the soda-water way, by pumping in carbonic acid, and the second method was by putting tea liqueur into wine previously made effervescing, according to a scientific method. The tea liqueur being put in, it was allowed to deposit; the deposit was disgorged according to the rules of the art, and you have on the table the product which I call effervescing tea *par excellence*. It is dry, but all these wines I have kept dry, according to the prevailing taste, which is, I think, correct in this respect. Of course, if the experiment were carried out on a large scale, sugar could be added to any extent, to please the taste of the consumer. I maintain that, as wines are still dear, and are getting dearer every year, and as they lack certain keeping qualities, particularly champagne, which cannot be sent, for example, to China or Japan, because it would ferment a second time, and as these tea wines are so unfermentable that if you even put yeast and sugar into them and keep them at a temperature equal to that of the human body for six weeks, you will not get more than one bottle in a hundred to ferment, it is certainly useful to have an unfermentable effervescing wine which can be transported anywhere, and considering the great use which effervescing wines are, and the great boon which they would be considered by many persons abroad who are at present unable to obtain anything of the sort, the experiment is certainly worth trying. I shall be happy for any one present to taste these wines. The tea makes them a good stomachic, and as alcohol is present in small quantity, the exhilarating effect is unaccompanied by any evil consequences, while, at the same time, no one can drink half, or even a quarter, of a bottle without feeling unmistakably that, in ordinary phrase, he is "the better for it."

DISCUSSION.

The Chairman said the subject which Dr. Thudichum had treated was one of such general interest, that he had no doubt many members would give the meeting their knowledge and experience on the subject. Certainly, the very wide-spread habitat of the vine, and its indigenous character in this part of the globe, seemed incontestibly proved. Amongst the processes of treatment to which it was commonly reported that wines were frequently subjected, there was one which he happened to hear mentioned some time ago, in Germany, as being exceedingly prevalent there, and this process, although, no doubt, like any other, it might be carried to excess, did not seem in principle to be at all unreasonable. He alluded to the addition of glycerine. It was, no doubt, known to many of the members that a very illustrious French chemist demonstrated, some time ago, that glycerine was always present in fermented liquids, so that the addition of this substance had only the effect of increasing the quantity of a normal constituent of the wine. Another process which he was informed was carried on in Germany, and which, from a scientific point of view, would certainly appear exceedingly legitimate, was to enrich the juices of poor grapes, which were peculiarly deficient in sugar, by the addition of sugar before fermentation. This certainly seemed a reasonable direction in which they might hope for an improvement in the manufacture of wine.

Dr. ELLIS wished to ask the reader of the paper if he knew of any other use that wine had, except those mentioned. He (Dr. Ellis) had been for twenty-five years studying the question, and had not been able to discover that wine, used as a beverage, was of any value to man. He contended that wine was chiefly drunk for the stimulating effects produced by the alcohol which it contained, and that therefore it was a mistake to speak of it as quenching thirst, since what he considered the essential and characteristic constituent of wine—its alcohol—could no more quench thirst than could spirits of turpentine, oil, or any other inflammable substance. He never prescribed alcohol medicinally, as he was unable to discover that it ever did any good in cases of disease. For his own part, he hoped that the result of the paper would be to induce a more thorough investigation of the value of wine, either as a beverage or medicine.

Mr. BOTLY said he could not at all agree with the views of the last speaker, his own experience having taught him the contrary; and he mentioned several instances which had come under his own observation, in which the use of wine under medical advice had been productive of immediate and lasting benefit.

Dr. DUPRÉ said there was not much left for him to add, after the admirable paper of his friend Dr. Thudichum; but he might say, in reference to what had fallen from the Chairman, that it was a general practice to add glycerine to light wines, because while it was one of the natural constituents of wine, and gave a slight additional sweetness, it also had the property of being unfermentable, and it removed the harsh taste which some acid wines possessed. There was another process in common use, which was as follows:—If the must contained too large a quantity of acid, it was reduced, by means of the addition of water, to what was considered the normal standard; by this means, however, the proportion of sugar was also considerably diminished, and it had to be brought up again to the proper standard of about 25 or 26 by the addition of sugar. This process would be a very rational one, if the sugar added were of the same kind as that present in the must. This, however, was a kind called invert sugar, and consisted of two kinds of sugar in equal proportions, fruit sugar and grape sugar. It was a very general notion that grapes contained grape sugar only, but this was not by any means the case, and therefore the addition of grape sugar only gave one-half of the sugar which ought to be present in the wine. In consequence, this addition did not bring up the must to the original natural standard. The proper addition would be cane sugar, which, by the action of the acids, would be converted into the identical sugar present in the grape. Unfortunately, however, cane sugar was rather too expensive, as it was only the cheaper kinds of must which were treated in this way, and therefore grape sugar was used, which was made from starch and sulphuric acid. This kind of sugar often contained many impurities, which were thus transferred to the wine, and sometimes gave it an unpleasant taste, and it did not keep so well as naturally prepared wine. As to the alcoholic strength of natural wine, it was very rarely found to exceed 12 or 13 per cent., which was equal to about 26 per cent. of proof spirit, which was the standard fixed by the present law, below which wines were admitted at the one shilling duty. An agitation was going on at the present time, for the purpose of having the stronger wines admitted at the same duty, and it was said that it was very unjust to charge 1s. for wine with 25 per cent. of proof spirit, and 2s. 6d. for a wine with 26 per cent. There could be no doubt, however, that wine was never fortified to so small a per-centage as 26 per cent., except for the purpose of smuggling it in as natural wine, when it was too poor to keep of itself. Any wine which was treated as a genuine fortified wine, was rarely fortified to less than from 32 to 36 per cent., and very frequently it was found to contain as much as 42 per cent. Now, to bring wine of 26 per cent. strength up to 42 per cent., would require the addition of about 28 gallons of proof spirit to every hundred gallons of wine. Now, if that were imported as proof spirit, it would have to pay a duty of about 260s. or 270s., which, with the 100s. on the original wine, would bring the whole duty up to about 3s. a gallon. Of course, if wine were brought up to this strength, a similar duty should be imposed, and as it was not practicable to analyse every sample of wine, it was perfectly just to charge a general duty of 2s. 6d. per gallon for fortified wine. It would evidently be very unfair to the English distiller if he had to pay 10s. duty on every gallon of spirit, while the foreign wine-merchant was allowed to import, with every 100 gallons of wine, 28 gallons of proof spirit, at an almost nominal duty. It would be as reasonable to say that any man who chose to add spirit to his wine here, ought to have the duty returned. Dr. Thudichum had alluded to some of the ethers of wine, upon which he (Dr. Dupré) had made many experiments, but these being merely chemical investigations, he could not indicate the effect which the wine produced on the consumer. It would be very desirable, therefore, for medical men, when they recommended a particular wine, that they should previously ascertain its chemical constitution, and afterwards note the physiological effects. At present, a chemist was almost incapable of forming an idea of the marketable value of a wine, one at 1s. a bottle sometimes giving a result almost identical with another at 15s. The chemical constituents were, however, to a great extent within the reach of the chemist, and they consisted chiefly of alcohol, sugar, acids, mineral salts, and ethers. All these things were within reach of the chemist, though at present we had but little knowledge as to their action when combined in various proportions. Medical men, too, often appeared to recommend a wine because they liked it themselves, without knowing anything of its composition, which was very important, because the taste alone was a very imperfect guide. A wine might be sweet, and at the same time very acid, for the acid would mask the sweetness; again it might be strong and very sweet, and the sweetness would mask the strength. Sometimes it might be of importance to the patient that no sugar should be given in the wine, but if the wine was of an acid character a great deal of sugar might pass unnoticed. Moreover, the acids of wine varied considerably. Some contained chiefly tartaric acid, in fact it was the general superstition that this was the prevailing acid of wine, but this was by no means the case, for port and sherry contained scarcely any. Port, being of too great alcoholic strength, the alcohol precipitated the acid in the form of tartrate, and sherry, because the plastering to which it was subjected, nearly without exception, removed nearly all the tartaric acid, and replaced it by sulphate of potassa, a very active saline agent, which, like most salts of potassa, had a very depressing action on the heart. Now wine was very frequently given for the purpose of keeping up the action of the heart, which, as all physiologists knew, was often of extreme importance, and could be effected in no way so well as by the administration of alcohol or wine; but it might often happen, in the case of sherry, the slight stimulating action produced by the alcohol would be entirely counteracted by the contrary effect produced by the sulphate of potassa. In such a case it might be very advisable to substitute madeira for sherry, as it contained very little sulphate of potassa, and was in other respects a wine of much the same character. All the compound ethers found in wine had a strong physiological effect as stimulants, particularly the volatile ethers. They differed very much in different wines, but abounded principally in natural wines, to which they gave flavour and bouquet. All fortified wines, however, with the exception of port, sherry, and madeira, contained little of these volatile ethers, but a greater proportion of fixed ethers, which had not nearly the same flavour and bouquet, nor the same stimulating power. In some cases the administration of alcohol would be decidedly injurious, while it was at the same time necessary to apply a stimulant, and in such cases it would be desirable to select a wine combining the minimum amount of alcoholic strength with the maximum amount of volatile ethers, and in this way a stimulating effect would be produced without the depression which frequently followed the administration of alcohol. For instance, they all knew that champagne was not a strong wine, but at the same time it was very stimulating, and this property it owed to the large proportion of volatile ethers it contained, as well as to the carbonic acid. As he had said before, however, comparatively little was as yet known of the effects of different wines, and he had thrown out these hints in the hope of inducing physicians to take up the subject and investigate it, for he believed that in this way only would a real knowledge of wine be advanced.

Dr. Thudichum then proceeded to show and describe a number of photographic slides, illustrating the different methods of viticulture practised in various parts of Europe.

The Chairman proposed a cordial vote of thanks to Dr. Thudichum for his very able paper, which was carried unanimously. Various descriptions of wine, described by Dr. Thudichum as made from tea, were then tasted, and the meeting separated.

SCIENCE COLLEGES. — MEETING IN MANCHESTER.

A meeting, called by the Council of the Society of Arts, was held on Friday, the 17th instant, in the Mayor's Parlour, Manchester, "to discuss the best means by which scientific instruction may be promoted, and to establish an organisation which will keep an influence at work to accomplish what is so urgently needed." The authorities of Owens College, and the members of the Society of Arts, especially those in the locality, had been invited by circular to attend. The Mayor (Mr. John Grave), presided; and there were also present—Sir J. Whitworth, Bart.; Mr. John Platt, M.P.; Professor Greenwood, Professor Williamson, Professor Reynolds, Professor Jack, and Professor Roscoe; Dr. Crace Calvert, Dr. R. A. Smith, Dr. John Watts, Dr. Pankhurst, and Dr. T. E. Thorpe; Messrs. Edwin Chadwick, C.B.; Councillor Joseph Thompson, Councillor Bailey (Salford), Joseph Catterall (Preston), James Worthington, Hugh Mason (Ashton), Thomas Ashton, John Plant, W. H. J. Traice, W. Boyd Dawkins, William Richardson (Oldham), John Walsh, Peter Spence, J. A. Bremner, Alfred Neild, John Rylands, William Hartley, &c.

The Mayor, in opening the proceedings, said this was a meeting called together by the Society of Arts, and those interested in Owens College had been invited to attend, the object being to endeavour by all means in their power to promote scientific instruction in this and other large centres of industry. Anything of that nature always received encouragement in Manchester, as it was always found that the more highly educated people were in technical matters, the better for the community. It promoted their interests, it elevated their position, and it was such a movement as must command the attention of the chief magistrate of the city.

Apologies for non-attendance were received from Sir Thos. Bazley, M.P., Sir W. Bodkin, Colonel Sykes, M.P., the Lord Chancellor, Sir Wentworth Dilke, M.P., Mr. G. Dixon, M.P., the Archbishop of York, Sir John Lubbock, Mr. Laird, M.P., Mr. James Howard, M.P. (Bedford), Mr. Snowdon Henry, M.P., Major-General Eardley Wilmot, R.A., Sir W. Tite, M.P., Mr. Alderman Rumney, Mr. Pease (Darlington), and Mr. Bremner. These gentlemen, while regretting their absence, agreed that their names should be placed upon any committee which might be formed.

Mr. Le Neve Foster, Secretary of the Society of Arts, read the following statement authorised by the Council:—

1. The Council of the Society of Arts have received a communication from Owens College Extension Committee, Manchester, asking their co-operation in the extension of technical education, or, more properly, Scientific Instruction; and it affords them much pleasure to do whatever lies in their power to advance this important national object. With this view, the Council have invited the members of the Society, and especially those resident in the locality, as well as the authorities of Owens College, to meet them in Conference on the subject, to discuss the best means by which scientific instruction may be promoted, and to establish an organisation which will keep an influence at work to accomplish what is so urgently needed.

2. The necessity and importance of improved scientific instruction for the people of the United Kingdom, in order that they may be placed in a favourable position in the race of industrial competition with other nations, has, for some time past, been forced upon the notice of the Society of Arts, whose chartered objects are the Promotion of Arts, Manufactures, and Commerce.

3. The great international displays of industry in 1851, 1855, 1862, and 1867, have shown unmistakably that, if this country is to maintain her position as a commercial and manufacturing power, the people (and in this term are comprehended not only artisans, but also persons of higher position in the social scale) must have at their command the means of education improved in its general character, and embracing, if not based upon, science to a far greater extent than has hitherto been the case. The official jury-reports at all the exhibitions abound in declarations of this character, and the country can no longer afford to ignore the fact, but must earnestly set to work to bring about a change. These reports, as well as those of the artisans who were sent to the Paris Exhibition of 1867 by the Society, one and all point out the great educational facilities which are available for all classes, and especially the artisan class, upon the Continent.

4. The Council are of opinion that existing schools and colleges, where science has hitherto been all but excluded, should adopt some means for its being taught; and that where such teaching already exists, measures should be taken for extending the usefulness of the institutions, and rendering them more easy of access to the great body of the people; whilst in localities where no such facilities exist, means should be taken to secure their foundation. The localities must themselves stir in this reform, and their efforts should be aided by pecuniary assistance and countenance by the State.

5. The nation must set itself earnestly to work to bring about the sought-for change in the education of the people. The evils have been so often pointed out, that it is unnecessary to enter into detail; our duty is to supply the remedy. This the Council believe to be by the localities setting themselves heartily to work, and when they have shown themselves in earnest by raising funds and organising establishments for the teaching of science, they should be entitled, as of right, to aid from the State.

6. In order, however, that such establishments, colleges, or schools should be of value to the mass of the people, so that they can take advantage of the facilities which would then be offered to them, it is absolutely necessary that elementary education, commonly known as primary education, should be extended far more widely than at present. To an ignorant population the establishment of colleges and schools for the teaching of science will be of little avail, and unless the blessings of an ordinary elementary education, *i.e.*, reading, writing, and arithmetic, at least, can be more diffused, so as to place our people on a par with those of Switzerland, Prussia, Saxony, &c., the attempt to extend the teaching of science will be in vain. Again, not only must we have improved elementary education, but these elements must themselves be taught by improved methods and organisation, so that less time may be occupied in acquiring them, thus leaving free for the learning of elementary science some of those years which are now unnecessarily taken up in mastering the mere rudiments of knowledge. Abroad, it is the custom of the state only to deal with this and many other matters of public concern, but such is not the case here. The Council do not recommend state interference as of choice, but of necessity. This work of education must be done, and it will have to be done wholly by government if not otherwise. Experience proves that it can be done by a combination of voluntary efforts, with government aid, as in the existing system of primary education, and in the instruction aided by the Science and Art Department. The Council think that the work is to be done in part nationally, in part voluntarily, but not upon a hap-hazard system.

7. Adam Smith, the earliest, and, perhaps, the first English writer on political economy, as well as Mr. J. Stuart Mill, its present most able exponent, recommend scientific instruction as profitable to the nation. Her Majesty's Government must not plead economy as an excuse, for the highest and wisest economy comes out of wise expenditure.

8. The Council believe that this is the feeling of the country, which the government will regard with respectful attention. Government must be urged to co-operate with Owens College and other bodies, either existing or to be established. Parliamentary grants are now made to the old universities of England and Scotland, and to the Queen's Colleges in Ireland, and there is no reason why the same principle should not be extended, and grants made to modern educational establishments in the great centres of industry. The Council are of opinion that a government resulting from a wide representation of the whole people ought adequately to represent the highest intelligence and aspirations of that people for improvement, and not limit its responsibility and its labours to matters of police. There can be no more profitable investment of national capital, drawn from taxes paid by the whole nation, than in promoting the best education among all classes of the people, and the widest extension of sound knowledge, on which the Arts, Manufactures, and Commerce of a kingdom rest.

(By order)
Henry G. Lennox, *Chairman.*
P. Le Neve Foster, *Secretary.*

Professor Jack moved :—"That in the opinion of this meeting the best interests of the country demand the establishment of a complete system of primary instruction, the extension of a system of science classes under a responsible department of the government, on a definite plan, and especially the establishment of science colleges in the principal industrial centres of the United Kingdom; that such colleges ought to be established and maintained partly by local efforts and partly by liberal assistance from the State, and that existing institutions, such as Owens College, ought to be made available for this purpose." He said it was scarcely necessary for him, in moving the resolution, to say a word in disclaimer of any personal motives on the part of the authorities of Owens College. They had been put forward, partly from the circumstance of their being the only college in the district, and partly from the action of gentlemen who had interested themselves with a view to extend the operations of the college. The fact that by their efforts they had already realised the sum of £90,000, sufficiently showed that they were asked by public opinion to take a prominent part in connection with the development of science. But of course the resolution did not speak of this locality alone; it required the government to come forward and support the efforts made in other localities. From the first the promoters of the extension of Owens College had taken this necessity into consideration, and they were met by the government of the day with the statement that it was impossible to recognise their claim without recognising a general principle; and they came there, not supporting a personal claim, but supporting the claims for the establishment of a great general principle. They asked the government of the day to organise Scientific Instruction for all. Perhaps, in one sense, science could not be organised. The man of science, like the poet, *nascitur non fit,* and this would refer to such men as Watt, Faraday, and Joule; it was impossible to organise a system for the production of men of genius. Perhaps this country had, more than any other, men of genius who had not been organised by any government or by any system. But, notwithstanding that, it was possible for them to organise, and it was necessary for them to organise, a broad system for carrying scientific instruction to the mass of the people. The men of genius could not be increased by the action of the government; but, on the other hand, they might be asked fairly whether a system of organisation would not be found to warp and stunt the development of men of genius. In the early history of this country they had a sufficient answer to this statement. Watt, who was one of their greatest men, commenced by assisting Black; and Faraday commenced by assisting the professor of natural philosophy, Sir Humphry Davy; and it was precisely by increasing the regular inter-communication between organised teaching and the ability to teach that they could expect science to be carried from the higher mountain peaks, upon which light would always shine, down upon every man in the country. They did not suppose that they should raise more men of genius, but it was necessary to organise some system for the regular diffusion of science. In that way they ought to accomplish two things. They ought to find out who were the men of genius, and who were the men of talent in the country, to a greater extent than at present. He thought they could point with pride to the men of genius and talent whom England had been able to put forward; but he believed many more had died "mute inglorious Miltons," and that the nation, glorious as its past history had been, would write a nobler record upon the history of the future. He believed, further, though it might appear to be a lower aspect of the question, that to diffuse scientific knowledge among the mass of the people had another and more material object. He should not, however, say anything about the matter in a commercial point of view, as there were gentlemen present who could speak on this aspect of the subject much better than he could; but it was obvious that the system would prove one of the highest agencies of civilisation. At this time, when so many questions were disputed, and science questions among the rest, there was one principle which underlay the efforts of every man of science which made them hopeful; and that was, that while their conclusions might be disputed step by step, and point by point, there was certainty at the end of them. The knowledge of science was a great civilising agent, and he believed that, by making Owens College the great university of the north of England, they should not only be promoting their own commercial prosperity, but the general welfare of the country.

Dr. **CRACE CALVERT**, F.R.S., said he had sincere pleasure in seconding the resolution, being convinced that it would be for the interests of Manchester, and of the people at large of this country, if such an institution as that proposed should be established. During his career in Manchester, he had frequently had occasion to go into many large establishments in Manchester, and there he had found plenty of practical knowledge, but not many traces of sound scientific training, and it was impossible that the manufacturers of the present day in this country could hope to maintain their position, if a better system was not adopted. As it was stated in the document put forth by the Council of the Society of Arts, it was impossible for the manufacturers of this country to keep their position, unless their workmen and those connected with them—managers as well as directors—were well acquainted with the elements of science. He had met with much dogmatic ignorance. Those who, like himself, had been connected officially with the Exhibitions of 1855, 1862, and 1867, must have been struck by the wonderful progress which many of the manufacturers on the Continent had made, compared with those of this country, and the only possible explanation was the great care and trouble which continental governments had taken to establish science colleges, where the artisan, as well as the better educated classes of young men, could get a thorough knowledge of science. If they were to take advantage of experience, none was of more importance, and none was more instructive to them, than that of continental nations. If they went into large manufacturing towns in France, such as Rouen, they would find schools of science supported by government and by local taxation. They would find schools for art, for science, and for the practical application of science; and any one who, like himself, had had to do with manufacturing processes for a quarter of a century, must be convinced that it was to the interests of this country to carry out the objects of the resolution which had been proposed.

Mr. **JOHN PLATT**, M.P., supported the resolution. He said he had for years taken a deep interest in the matter of technical instruction, and he had assisted in the formation of a school of art in his own town of Oldham. The result had been most satisfactory, not only to the place, but to himself, as an employer of labour. Many deficiencies had existed, more especially in drawing and chemistry. Formerly they could not, in his establishment, meet with persons who were capable of taking a sketch, for instance, of a machine, and of working and carrying out the details; but since the school had been in existence they had found boys very apt and ready to take up technical knowledge, and matters connected with the manufacture of machines. The question to employers of labour was one of immense interest, as they found they had to compete with a great many parts of the Continent, where the artisans were very carefully trained. It was a singular fact that, although we had more practice than any other country in the world, still we had been dependent to a large extent for scientific instruction, particularly with reference to manufactures, upon the Germans and the Swiss. He did not say this in disparagement of his own countrymen, as he believed it was a department of instruction which had never been brought under their notice, and they were only beginning to realise the value of this kind of instruction. But since it had been established, and more particularly in his own place, they found that they had English people who had attained such an amount of knowledge of this kind that they were practically independent of either the Germans or the Swiss. Coupled with that, the boys in their manufactories had a much better practical knowledge of the manufactures in which they were engaged, so that all that was required to give a position to our own manufactures was simply that a system of scientific instruction should be largely developed and encouraged throughout the country. Although many employers of labour had taken up the subject, it was one which they could not be expected to carry out on their own responsibility. They could not sustain schools of science and art in many of the large manufacturing towns without the aid of government. Notwithstanding Professor Calvert's experience, he (Mr. Platt) did not intend to be a "croaker." He did not endorse many of the expressions which had been used with regard to the Paris Exhibition. Although in that country they had progressed in machine-making, still, if they came to examine their productions critically, they would find that there was no novelty in them. The manufacturers there were mere copyists of the best makers in this country. So that although they were anxious that all the faults of the English people should be exposed, still he did not see any good in making this country to appear worse than it was. The difficulty they had to contend with was the selection of good masters; but that difficulty would in time be overcome. He heartily welcomed the gentlemen from the Society of Arts. He was glad that they were interesting themselves in this subject, and he knew of no place where their efforts would be more highly appreciated than in Lancashire.

Mr. **E. CHADWICK** asked, for the information of the meeting, how many persons Mr. Platt was accustomed to employ.

Mr. **PLATT** said at one time they had altogether 7,000 engaged in that particular branch. At present the number was about 5,000.

Mr. **HUGH MASON** said he rose to cordially support the resolution, but he did so in order that he might add an explanation which he felt justified in making. He had held the opinion that the needs of any particular locality for educational purposes ought to be supplied by the locality which would have the advantage of the system established, provided the locality should be able to do so. He might say that he personally had supported the movement for creating a new building for Owens College; but he had hardly felt it his duty to support the movement for dipping pretty deeply into the public purse. He had done so because he felt that South-east Lancashire, of which the great city of Manchester was the centre, was rich enough to do all that was required, but he had found in the course of this movement that although South-east Lancashire was rich enough—and he thought no one would dispute the statement—it had not been willing, and he was afraid the unwillingness was to be attributed to ignorance and selfishness. It seemed hardly fair that where there was, should he say, a minority in this district who were willing to do what they could, and who saw that the district required greater educational means, they should suffer through the ignorance and selfishness of a certain number. He was afraid that the work they had set themselves to do was beyond the means of individuals who might be willing to contribute and to work for the prosecution of the movement. But, in seeking increased grants from government, he could wish those grants not to be so partial as they had been. For instance, he should like Lancashire to have a fair share. He should like this for two reasons—because Lancashire contributed a considerable sum to the means which were distributed in other parts of the country, and because he thought Lancashire would benefit, and be the means of distributing benefit, by any grants which might be made by the government. He should hope that the whole of the money would not be absorbed, say, by the metropolis. One's own ideas and the experience of government grants had been that they were not altogether free from jobbery, and he believed that the best means to prevent any suspicion of jobbery was to impose certain conditions upon the localities which government should aid. He thought that by the union of a department of government and the localities themselves, not only would these grants be free from the suspicion of jobbery, but the grants themselves would be much more usefully applied than they might have hitherto been.

Dr. John Watts feared we had receded in the last 20 years in this locality, through the influence of the revised code, which gave the primary schoolmaster no interest in teaching anything but reading, writing, and arithmetic; though lately the department had a little encouraged higher teaching. One of the points in the resolution was, that the science classes which were already at work ought to be extended upon a definite system. A gentleman in the room had lately said at the Society of Arts that the only stable thing at South Kensington was instability. He fully adopted that sentiment, and he would, in the presence of Mr. Cole, bring a very serious charge against his department. In September of the present year, a minute was adopted which would have the effect of knocking aside nearly one-half of the remuneration of the science teachers of the present session. This had been done, not only without consulting the teachers, but after they had arranged for their classes upon the understanding of the old minute. He did not know how sufficiently to express his feeling upon this subject. He could not understand how men like Lord de Grey and Mr. Forster, for whom he had the highest respect, could play such a trick—he could call it by no other name. If the science classes were to be extended, it must be done upon a plan which the teachers could understand and have faith in. Twelve months' notice ought to be given of any intended alterations, so that class arrangements might be relied upon. To interfere with teachers' means of living in this way was not fair, and the Department ought to reconsider the matter, so far as this year was concerned. One of the best things government had done was the establishment of these science classes. The resolution also affirmed that it was for the best interests of the country that we should establish science colleges, for the complete scientific education of our youths, and the utilisation and development of the best intellect in the land. The benefits of such a system to the country would be inestimable. He sympathised with Mr. Hugh Mason's desire for complete local government, and we could not have this so long as we went to the public treasury; but we were not in a position to work perfect theories of society; we were a bundle of compromises, and must be content with the greatest good we could get at the present time. It would not be desirable to withdraw government grants, considering the amount of ignorance and apathy in the country upon this question. There was not a college in the world that was self-supporting. Dr. Watts proceeded to enlarge upon the absolute necessity of government aid, and to enforce the claims of Lancashire to a share in it.

Mr. Boyd Dawkins also supported the resolution, which was then put, and carried unanimously.

Mr. Joseph Thompson moved—"That the gentlemen present be requested to form themselves into a committee, to promote the objects stated in the foregoing resolution, with power to add to their number."

Mr. W. H. J. Traice seconded the resolution, and contrasted the Exhibition of 1851 with that of 1867. Looking down the catalogue of the former, they would not find in the list of French exhibits any that stood in rivalry to English manufactures; while, in 1867, they would find the catalogue crowded with mechanical objects, the work of the French themselves. This might be accounted for partially by the fact that, in 1851, the French had to cross the Channel, while, in 1867, they were at home; but other causes had been at work, and much must be attributed to the causes mentioned by Professor Calvert, who spoke with authority on the subject. It was an egregious error to say that Lancashire did not already derive some benefit from the Department of Science and Art, as they had classes established and prizes and certificates distributed. Still, the system ought to be greatly extended.

Dr. Pankhurst supported the resolution, which was passed.

Mr. Edwin Chadwick, C.B., in proposing a vote of thanks to the Mayor for the part he had taken in the proceedings, observed:—It has been, and will be objected in some quarters, that the present, being a period of manufacturing distress, is the period for reduction rather than the augmentation of expenditure. To which I answer, that we propose expenditure as means which, if properly applied, are the best for the relief of the long-continued distress of this great district, and, in illustration of this policy, I cite the experience of the district itself. The late Mr. John Kennedy, of Ardwick-hall, who was called the "father of the cotton manufacture," was accustomed to say that he never knew any improvement in that important manufacture adopted except on "threadbare profits." Coming here when there were loud complaints of bad times, I have seen old mills in course of alteration and extension, and have said, on the first impression, to my relatives and friends here, "Why, you are saying how bad trade is, and yet you are building new works." "Yes," was the answer, "we are extending our works because trade is bad, and because we do not get on with the old ones." The fact is, they were reducing the proportion or pressure of establishment charges by spreading them over a wider basis of production—they were rearranging their machinery, and reducing the cost of production by enabling two men to do the work of three; and they were doing this by an economical application of expenditure, by which they reduced the cost of production, and by lower prices they stimulated consumption, extended their sales into new markets, and placed consumption, or the manufactures, thenceforward on a wider basis. Now, the present depressed condition of manufactures is one that not ignorance but the science teaching we propose will retrieve. Foreign manufactures are undoubtedly making way, and advancing against us in neutral, and may be in home markets, and they are doing so by science and by labour, improved in quality by education. Thus, in Switzerland—at least in the Canton of Zurich—of which I may speak, the superior secondary and scientific education, based upon superior primary training and instruction, is providing superior foremen and leaders, not only for their own places, but for other places abroad, and some of them may be expected over here to occupy places which the neglected training of our own population does not enable them to fill. France has got advancing rival manufacturers. Amongst the foremost leaders of them are to be found men of the highest scientific training, obtained from what I may call the great Owens College of France, the Ecole Centrale des Arts-et-Métiers of Paris. As against them, the old "rule of thumbism" will no longer avail, and we propose expenditure for science instruction as the best means of relief. A recent minute has been referred to as one of discouragement to trained teachers, who are certainly needed to effect any advance. I have not seen the minute, but if it be so, it will be one that will have to be retrieved; for "as is the teacher" so will be the school, or the college, and a high order of teaching power is an economy and indeed a necessity. I have recently been in Holland, where I found that the government was improving secondary and scientific instruction most successfully, on the half-time principle of three hours of daily instruction, given at night, as is done here in the Owens College. But, to do this, they were improving their primary instruction, and to do this they were improving the quality of the teaching-power—they were carefully improving the position of the trained school teachers, by giving them securities against the caprices of ignorant and irresponsible burgomasters; they were making the school teachers only removable on cause shown, before competent and impartial judges, superior school inspectors; they were promoting or conciliating the removal of old and inferior teachers, by giving them suitable retiring pensions, and replacing them by trained teachers, whose competency was tested, and jobbing and favouritism prevented, by competitive examinations, and by probationary trial under competent judges. All the proper expenditure for this is a a proved means of economy, under conditions which we have to imitate; for nothing is so wasteful as ignorance, whether of teachers or of populations.

Mr. T. Ashton, in seconding the resolution, expressed a hope that the movement for a general system of scientific education would not delay or prejudice the claims of Owens College.

The resolution was passed unanimously, and having been briefly acknowledged by the Mayor, a vote of thanks was also passed to the gentlemen representing the Society of Arts, on the proposition of Professor Greenwood, seconded by Dr. John Watts.

Mr. Le Neve Foster, in reply, said that the Council did not intend to rest where they were, but to continue to agitate the question until they obtained what they wished. They intended to hold meetings in other large centres of industry throughout the country.

This concluded the proceedings.

PRINTS AND THEIR PRODUCTION.

Those who were present when Mr. Davenport read his paper before the Society, on the 8th instant, need not be reminded that the collection of prints shown on that occasion (and still on view), produced by various processes, is of an historical character. In arranging it, it has been the object of its originator to illustrate the results attained by each of the processes employed, rather than to point attention to the works of any particular masters or schools of art growing out of the processes employed.

The series of specimens commences with examples of prints from wood or metal blocks, either simple or compound, and of plain as well as coloured impressions obtained by their means, but by a single operation of the printing press. A series of impressions from the blocks cut by Bewick illustrates the degree of perfection to which wood engraving was advanced at the close of the last century.

Prints from engraved copper plates follow next, and they illustrate the results attained by simply cutting away portions of the surface of the metal plate by the graver; the action of acids, as applied in the production of etchings; and the results of a combination of etching and engraving, as those arts were practiced at the period when Hogarth began his career. The results obtained by means of the line, chalk, mezzotint, and aquatint processes, are each in their turn exhibited, and attention is directed to the fact that, in the early history of reproductive arts, the illustrations of our literature were not only pictorial but decorative. Tinted prints and prints in colours, produced at a comparatively early period of the art, are also exhibited, as showing the desire which has always existed to get rid of the coldness of effect due to the use of black ink.

The art of engraving on steel next claims attention. With its introduction the character of the illustrations of our literature became entirely changed. It was necessary, in order to supply the increased demands of commerce, to employ a metal of greater durability, and from the period of its introduction, greater security and identity of product was effected in the manufacture of bank-notes, by means of the siderographic process of Perkins and Heath, the same process which is now used in the production of our postage-stamps, prints of which, from the original engraving by Heath, are exhibited.

The attention is next directed to the process of lithography, and the results which have been attained under its present development as a chromatic art, this process and wood engraving, as at present employed, having superseded and practically destroyed the older arts of engraving.

Following the lithographic examples, is a large series of prints in carbon obtained by a variety of photographic processes. It is curious to remark that the past, the present, and the future, of our print-producing powers have each been based upon entirely distinct principles. As greater facilities for producing prints was demanded, a weaker and apparently less durable source of production has been, and appears in the future to be likely to be still more resorted to. Thus, in the past period, engravings were executed, and prints obtained from copper and steel plates. At present, wood blocks and lithographic stones are employed; but the future of our art-producing power appears likely (so far as we at present know) to rest on what are apparently still less durable, viz., gums, resins, and gelatine. The series is brought to a close by juxtaposing the works of Doo, Cousins, Landseer, and others, engravers of our own times, as published by Mr. Graves and others, with various photographic processes, the principal of which are those of Mr. Pouncy, Herr Paul Pretsch, Mr. Swan, of Newcastle, the Autotype Company, of London, and Mr. Woodbury, as well as the fine examples by M. Tessier du Motay, of Paris (the publisher being now M. Arosa), and Herr Albert, of Munich.

The collection consists of about 300 examples, and presents a sort of panoramic view of prints and reproductive art during the past century and a half, and it is interesting as showing the direction in which we must look in the future.

WORKMEN'S INTERNATIONAL EXHIBITION, 1870.

The Council of the Workmen's International Exhibition, to be opened on the 7th of July, 1870, at the Agricultural Hall, Islington, has arranged to hold a conference of delegates from the towns of the United Kingdom, and of other countries, on the 10th of January next, at the house of the Society of Arts, by permission. The day's business will begin at ten a.m., and will be distributed as follows:—

1. Statement and discussion of the proposed method of arrangement.
2. Statement and discussion of the proposed system of prizes and appointment of jurors.
3. Discussion on the opening of workshops in the exhibition.
4. Reports, statements, and suggestions from local committees.
5. Statement and discussion as to the means to be adopted to make the exhibition promote the interests of technical education.

Mr. Mundella, M.P., and Mr. S. Morley, M.P., will successively occupy the chair during the day's sitting.

The conference will be brought to a close at four p.m., and all the delegates are invited to meet the Council at dinner (Mr. T. Hughes, M.P., to preside), at 5.30.

In the evening, a public meeting will be held at 8.30 p.m., at Exeter Hall, at which Professor Huxley will preside, if it should be impossible for the President (the Right Hon. W. E. Gladstone, M.P.) to be present.

The following resolutions will be moved:

1. "That the principles laid down in the prospectus of the Workmen's International Exhibition of 1870, which require the worker's name to be attached to the article produced, are both just and useful, as tending to give the workmen their share in the credit of production, and to increase the pride and interest which attaches to skilled labour."

"2. That it is of the highest importance to develop amongst all the people a true perception of what is beautiful in colour and form, and a scientific knowledge of the machinery and material employed in existing industries; and this meeting pledges its best exertions to promote the success of the Workmen's International Exhibition of 1870, as a valuable instrument to this end."

3. "That the trade knowledge and aptitude for combination shown by workmen who can produce, for a

workmen's exhibition, an article requiring many different kinds of labour, deserved the encouragement of every class as the first steps towards greater and more important kinds of co-operation."

4. "That it is in the interest of all nations that each should stimulate the other in the development of their highest productive powers, the prosperity of every people requiring continual progress in the cultivation of human faculties, and that perfection of method and machinery which yields the largest return to the day's labour."

The following gentlemen will be present at the conference and at the meeting:—The Marquis of Clanricarde, K.P., Mr. John Walter, M.P., Mr. W. H. Smith, M.P., Mr. Winterbotham, M.P., Mr. Andrew Johnston, M.P., Sir D. Salomons, Bart., M.P., Sir John Lubbock, Bart., Professor John Tyndall, Mr. Henry Cole, C.B., Captain J. Selwyn, R.N., Mr. George Dawson, of Birmingham, Sir George Young, Bart., Mr. Norman Lockyer, Professor Leone Levi, Mr. C. J. Roundell, Mr. Allen (Sec. of Amalgamated Engineers), Mr. R. Applegarth (Sec. of Amalgamated Carpenters and Joiners), Mr. T. J. Dunning (Sec. of Bookbinders' Trade Society), Mr. G. J. Holyoake, Mr. Geo. Howell, Mr. Geo. Odger, Mr. R. Coningsby, Mr. Walker (Sec. of Foremen Engineers), Mr. W. R. Cremer, Mr. Geo. Potter, &c.

The council strongly hope that all towns in this and other countries will lose no time in calling together a public meeting and appointing delegates to attend the conference. Such delegates must be appointed by public meeting, and the honorary secretaries will be extremely glad to receive, as early as possible, the names of those who will attend. The council are specially desirous that co-operative, trade, benefit, and other societies, and workmen's clubs and institutes, and large workshops, should also send delegates on this occasion. They request that all such societies should put themselves in communication with the secretaries, and assure them that their representatives will be gladly welcomed. The council will provide accommodation, for the night of the 10th of January, for those delegates who wish them to do so, and will otherwise do all in their power to facilitate the attendance of their visitors, on receiving communications on the subject. They urge all those who are interested in the carrying out of a workmen's international exhibition to take immediate steps for calling together a meeting of their fellow-townsmen, for the purpose of making better known the character of the undertaking, and appointing committees, where they are not already in existence, to increase the number of intending exhibitors.

The honorary secretaries are the Hon. Auberon Herbert, Mr. Thomas P. Paterson, and Mr. J. W. Probyn, and communications should be addressed to them at 150, Strand.

INSTRUCTION IN SCIENCE AND ART FOR WOMEN.

In the concluding lecture of his series, Professor Huxley pointed to the connected chain of numerous existing records which unanswerably proves the great antiquity of the world. This chain, at the lowest calculation, extends over a period of 280,000 years; and its clearly defined continuity must greatly impress all with a sense of the consistency and grandeur of the whole system of nature. Professor Huxley declared that there could be but little doubt that, at some period, the earth possessed no crust, and was merely a globe of gaseous vapour.

The educational benefits which the audience of these lectures have, it is hoped, derived, cannot be over-estimated. They tend to enlarge the capabilities of thought, and to render every day occurrences in nature more comprehensible.

Professor Guthrie commences his course on "Elementary Physics and Chemistry," January 18th, 1870.

The following are the notes of Professor Huxley's last three lectures:—

Lecture X.

1. The climate of the basin of the Thames, and of Britain generally, is influenced by all the conditions which have been mentioned.

2. Animal and vegetable life can be maintained only within certain limits of temperature and moisture. Hence, the climate of Britain is one of the leading conditions of the existence of its living population.

3. The native animals of Britain are all found on the Eurasiatic continent. Some may have reached Britain by emigration, but it is impossible that all should have done so, under the present geographical conditions.

4. The human inhabitants of Britain have the same linguistic and physical characters as the people of the adjacent parts of the Eurasiatic continent. It is possible that Britain was peopled with men by migration under the present geographical conditions.

5. At the earliest period recorded in history the animal population of Britain was the same as it is now, and the human population lacked only the Roman and Teutonic elements.

Lecture XI.

1. The gravel which lies at the surface of the Thames basin is, for the most part, river gravel. It contains the remains of elephants, rhinoceroses, oxen, bisons, and musk sheep, with flints worked into implements by man.

2. At the time this gravel was formed, the British Islands were united with the continent of Europe, and the Thames flowed into an estuary common to it and to the Rhine.

3. Some of the gravel of the northern half of the basin of the Thames is drift gravel. It consists of fragments of rocks from distant localities, which have been brought into their present position by ice.

4. At the time the drift gravel was formed, Britain, north of the Thames, and all the northern regions of Eurasia and America, were covered by ice, or an icy sea.

5. The London clay is the mud of the estuary of a great river. It contains the remains of palms, of crocodiles, turtles, and other animals found only in hot climates.

6. The chalk is the mud of the bottom of a deep sea, which overspread the site of what is now a large part of Europe, Asia, and Africa. Neither the Pyrenées, nor the Alps, nor the Himalayas, were in existence when the chalk was formed.

7. The chalk was formed and upheaved into dry land before the river which gave rise to the London clay existed. The London clay was (at any rate in part) converted into dry land before the drift gravel existed. The river gravel is more recent than the drift gravel.

8. The climate of England during the deposition of the London clay (eocene period) was much hotter than at present; during the formation of the drift and river gravels (glacial and post-glacial periods) it was much colder than at present.

9. The animals and plants of the chalk, were, for the most part, very different from those which now live in the British Islands, or the adjacent seas, or, indeed, exist everywhere. The likeness of the eocene forms to existing animals and plants is far greater; while many of the glacial and post-glacial animals are identical with those which exist in or near the British area.

Lecture XII.

1. The gravel, the clay, and the chalk of the Thames basin record a vast period of time, during which the operations of denudation and reparation, and the general circulation of this matter of the world, went on as at present.

2. The series of deposits in the Thames basin is exceedingly incomplete. Superimposed upon the London clay, elsewhere, are the nummulitic limestones which were once formed at the bottom of a great ocean, nearly as extensive as that of the chalk.

3. Upon the nummulitic limestones again, the great series of deposits called miocene rest. They contain the remains of great numbers of terrestrial animals and plants closely related to, but for the most part different from, those which now exist. During their formation, France was as full of volcanos as Iceland is at present.

4. Subsequent to these, in various parts of England and of Europe, are great masses of pliocene deposits, the animal remains in which are still more like those of the present day.

5. The drift, represented by the beds of gravel in the Thames basin, consists elsewhere of great thicknesses of clay, sand, and gravel.

6. The post-glacial period has been of very great duration.

7. The stratified deposits, from the chalk upwards, which are alone accessible in the Thames basin, constitute a mere fraction of the total series of such deposits; consequently, as there is no reason to believe that the processes of denudation and reparation were, on the average, more rapid when the oldest of these deposits were formed than they are now, the enormous period of time recorded by the floor of the Thames basin can be but a fraction of that recorded by the whole series of stratified rocks.

8. At the oldest periods of which any record exists, the earth had a solid crust, which was the product of the aqueous denudation of some pre-existing solid crust; and, from that remote period to the present day, the matter of the earth has circulated from form to form, as it is now circulating in and around the basin of the Thames.

Fine Arts.

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Statue to Lamartine.—A subscription opened for this purpose by the ministerial papers of Paris, met with very moderate success, but the people of Mâcon have furnished 52,200 francs for the purpose. It is decided that the statue shall be in bronze, and placed in the Place d'Armes, the largest public square in Mâcon.

Manufactures.

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Manufactures in the Philippines.—Various stuffs called "pina," sinamais," and "nipis," are manufactured in the islands of Panay and Luzon. Pina, made from the fibre of the pine-apple leaf (*Ananassa*), when worked with silk, costs 3 to 4 dollars the piece of five yards; gauze, from 5 to 6 dollars the piece. Tinampipi, a texture made from the filaments of the abaca, or so-called Manilla hemp (*Musa textilis*), fetches from 10 reals to 2 dollars the piece. Guinaras, coarse textures, made also from the fibres of this plant, and worn by the poorer class of people, cost but 1½ reals the piece of 5 yards. Many of these native manufactures being anything but durable, and, moreover, very expensive, are becoming rapidly superseded by the cottons and silks from Europe and China.

Commerce.

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The Madeira Vintage.—The following is from the report of Messrs. Rutherford, Drury, and Co.:—"It is expected that the quality of this year's vintage will be very good; but, as there was a little oidium, not so clean as that of 1868; there is, however, in such a regular climate as Madeira's, very little variation in the quality of the vintages (and therefore it is that the wines of each year are not kept separate); the best years, however, since the re-planting of the vineyards, were 1868, 1865, and 1863. The old sources of cheap wine in the north of the island have not been re-planted, the soil there being more suitable for cereals, &c. The quantity (estimated) this year is about 8,000 pipes; last year it was also about 8,000, *i.e.*, almost a third of the old average. Then (1868) the vines were an extraordinary sight, owing to the great number of bunches hanging from them from end to end, and every vineyard produced half as much again as was expected. Hitherto there has been a continued increase in the production, the quantity in 1867 having been about 4,000 pipes; in 1866, 3,000; in 1865, 2,000; in 1864, 1,500; in 1863, 1,000; and in 1862 to 1860, 500 pipes per annum. The vines in most vineyards on the south side are now from seven to ten years old, and look healthy; there are also a few of the old vines remaining. Therefore there need be no doubt now that the quality of the wine is as good as of old, though possibly it is not so alcoholic and potent; but this, for England at least, is an advantage. Our statistics for 1868 show an increase in home consumption in the United Kingdom of 25 per cent. over that of 1867. The manufacture of (so-called) wine from apples, &c., still continues, principally for consumption in the island, but it must enter more or less into the composition of any wines offered under £34."

Spruce Beer is a Dantzic speciality. It is a black liquor, made of a fermented decoction of the leaves and small branches of these trees, and properly sweetened. It is used for mixing with other beverages, and also for medicinal purposes, and exported exclusively to London. In 1867, 26,000 barrels, valued at 7s. 6d per barrel, free on board, were shipped.

Colonies.

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Tasmanian Medical School.—An important movement has been revived for the re-establishment of a medical school in this colony, for the training of pupils both belonging to the colony and to the neighbouring provinces. Something like an institution of the kind was commenced some years ago, when several professional men connected with the Hobart Town General Hospital moved in the matter, and obtained from the authorities in England concessions entitling Tasmanian pupils to a time allowance, on their presentation of colonial certificates of having passed through a certain curriculum of study. As the interest created by the proceedings of the Council of Education in connection with the A.A. degree and the English scholarships has led to a revival of this project, the chances are that some active steps will at last be taken to give effect to it.

Notes.

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Telegraphic Money Orders in France.—The French Council of Ministers have adopted a proposed plan of money orders by telegraph. The maximum for a single order is fixed at 5,000 frs. (£200). The dispatches are to be charged at the same rates as ordinary telegraphic messages, and the charge for the order is to be 2 per cent., or twice the rate charged by the post-office.

Exhibition in the Argentine Republic.—The government have received a communication from her Majesty's Minister at Buenos Ayres, with a copy of the rules and regulations for a National Exhibition to be held at the city of Cordova, in the Argentine Republic, on the 15th of October, 1870. These rules and regulations may be inspected on application at the Board of Trade, Whitehall-gardens.

Scholastic Registration Association.—The Right Honourable Sir John S. Pakington, Bart., M.P., will preside at the meeting in support of the Endowed Schools Bill (No. 2), which will be held at the Society's House, on the 11th January, at 7 o'clock, p.m.

Copyright in Newspaper Articles.—Vice-Chancellor Malins, in a case of alleged infringement, which came before him on the 21st instant, decided a point of great interest to proprietors of newspapers as well as the public. The Vice-Chancellor held that the proprietor of a newspaper had a copyright in the contents of his paper, and that, in order to entitle him to sue, it was unnecessary to register at Stationers' Hall under the Copyright Act.

Seaweed in Cooking.—The Chinese import large quantities of dried seaweed from Japan, and use it in cooking in the place of salt. They also employ it as a vegetable, and thicken soups with it like tapioca. It is collected on all the coasts of Jesso, and in the inland sea in the environs of Nagasaki and Simonosaki. It is an important article of export at Nagasaki and Hakodadi. The price is 2½ to 4 dollars the picul.

Correspondence.

Communication with Wrecks.—Sir,—In justice to the Society which has done so much in the matter of the communication between the shore and the wreck, I think it may be as well to call attention to the notice of a supposed new invention for the attainment of this object, now running through the papers. It is said that a professor, somewhere in Central Germany, has made the discovery that a line may be thrown, by means of a small mortar and shell, and that the professor further states that the line will not break, because the velocity is so small at the commencement of the flight of the shell. It is many years now that this mode has been in general use in all our ports and harbours, in fact, all round our coasts, and the line is only prevented from breaking by the proper disposition of the coil; that is, that the part running out shall never be overlapped by any other part of the line. In regard to this subject, I beg to add that I never understood how it happens that masters of vessels are seldom, if ever, provided with any means of communication with the shore in case of shipwreck, seeing that in every case both wind and sea must necessarily set in to shore, and, therefore, adverse to all shore attempts. Neither have I ever heard that Dansey's kites have ever been used, notwithstanding they can be set up on board in a few minutes, with a couple of boat-hooks and a spare boat's sail; they are certain to go on shore, and anchor themselves securely. —Yours &c., Henry W. Reveley.

MEETINGS FOR THE ENSUING WEEK.

Tues ...Royal Inst., 3. Prof. Tyndall, "Light." (Juvenile Lectures.)
Thur ...Royal Inst., 3. Prof. Tyndall, "Light." (Juvenile Lectures.)
Sat ......Royal Inst., 3. Prof. Tyndall, "Light." (Juvenile Lectures.)

Patents.

From Commissioners of Patents' Journal, December 17.

Grants of Provisional Protection.

Alum—3525—J. B. Spence.
Animals, shearing or clipping—3476—A. C. Henderson.
Bags, &c., fastenings and locks for—3506—J. and S. Loebl.
Bale ties—3535—B. J. B. Mills.
Blankets used by calico printers, material for—3513—J. Walker.
Boilers—3347—G. Betti.
Bread and biscuits—3540—J. Childs.
Breakwaters—3511—S. Alley.
Buckles—3539—F. A. Harrison.
Caissons—3488—A. Mitchell.
Calendering machinery, &c., rollers used in—3487—J. B. Wilson, J. Higginbottom, and I. Royse.
Capsules or packages for containing tea, &c.—3528—W. Geeves.
Cartridges—3533—G. Dowler and W. Pursall.
Churns—3482—H. C. Ash.
Cotton, &c., machinery for opening and breaking hard waste rags of—3496—W. Tatham.
Crucibles, &c.—3541—J. H. Johnson.
Drying machines—3469—R. Milburn and T. Browning.
Electric telegraph apparatus for continuous printing—3537—J. Watson.
Elevators for raising and stacking straw, &c.—3530—S. Lewin.
Engine and pump, revolving—3499—J. C. Wilson.
Figured muslin, &c., ornamenting—3552—A. M. Clark.
Fire-arms—3486—H. C. Pennell.
Food, &c., portable apparatus for carrying and cooking—3546—E. Weldon.
Furnaces—3536—W. Scott.
Furnaces and flues—3493—J. W. and E. Whittaker.
Gas burners—3554—E. Walker.
Gates, &c.—3551—A. L. Bricknell.
Glass—3549—B. F. Stevens.
Harness—3518—W. R. Lake.
Hinge joints, fastening objects capable of rotating on—3502—E. V. Neale.
Horse-shoes—3544—J. S. Robertson.
Iron tubes, &c., joining the ends of—3524—H. H. Murdoch.
Kitchen ranges, &c.—3478—W. Bennett and J. Currall.
Life-boats, &c.—3508—C. W. Petersen.
Liquid meters—3558—J. Loader and W. H. Child.
Looms, &c.—3442—B. Oldfield.
Malt, &c., desiccating—3474—J. Forbes.
Organs, &c.—3514—H. Alexandre.
Paper-cutting machinery—3510—H. M. Nicholls.
Paper-cutting machines, &c., apparatus for taking up, carrying, and laying sheets of paper delivered by—3498—J. M. Macintosh.
Paper pulp, straining of—3484—R. N. Slight and W. F. Denholm.
Paper, &c., substance to be used in a similar manner to alum, &c., in the manufacture of—3526—J. B. Spence.
Photo-mechanical printing, &c.—3543—E. Edwards.
Pipe wrench—3517—A. Ripley and J. Wormald.
Placards, &c., apparatus for exhibiting—3560—C. Sipriot.
Potassium, sodium, &c., producing—3505—H. Larkin and W. White.
Powdered fuel, burning—3504—T. R. Crampton.
Printing, lithographing, &c.—3500—W. MacLean.
Public conveyances, registering the number of passengers travelling by—3183—A. Grothe.
Rails for railroads—3521—J. L. Booth.
Rotary engines—3512—J. Knowles.
Safety lamps—3532—J. Swift.
Sausage-making machinery—3431—W. C. S. Percy.
Sawing machinery, &c.—3480—J. Peirce.
Screw propellers—3545—M. Kolb.
Sewage, treating—3550—M. F. Anderson.
Soda crystals—3472—W. Spence.
Spittoons—3490—A. P. Stirling.
Spring mattresses—3491—J. H. Johnson.
Steam engines, &c., packing glands for—3516—T. Macguire.
Steam engines, &c., working and reversing the valves of—3497—J. Smith and T. Eastwood.
Steam fire-engine pumps, &c., valves for—3495—E. Field.
Submarine telegraphic cables—3489—F. C. Webb.
Sulphuric acid—3494—P. A. S. Langlois and L. S. Thomassin.
Tea, &c., packing and consolidating—3534—J. Jonas.
Tobacco, spinning—3492—H. H. Mayden.
Umbrellas and parasols, covers for—3519—T. Clark.
Valves, self-acting escape—3520—S. Chatwood and J. Crompton.
Vessels, propelling and steering—3380—J. E. Crocé-Spinelli.
Vices—3562—W. R. Lake.
Water-closets, &c., regulating the supply of water to—3548—G. Preston and J. Prestige.
Worsted, &c., machinery for twisting—3547—M. Stell.
Yarn or thread, winding upon conical surfaces—3507—J. Boyd.
Yarns or threads—3566—J. Ballantyne.

Inventions with Complete Specifications Filed.

Animal carcases, &c.—3597—W. R. Lake.
Fire-resisting safes, &c.—3564—R. A. Ballon.

Patents Sealed.

1879. W. R. Lake.
1885. A. S. Harington.
1886. H. Bauerrichter.
1894. W. Pidding.
1895. A. J. Glas.
1897. A. Manbré.
1922. H. A. F. Duckham.
1945. F. Wohlgemuth.
1959. C. L. V. Yon.
1977. A. Walker.
2064. H. H. Murdoch.
2218. G. T. Abbey.
2997. N. Washburn.
2999. E. Roe.
3009. J. W. Robinson and T. Murray.

From Commissioners of Patents' Journal, December 21.

Patents on which the Stamp Duty of £50 has been paid.

3199. V. Vandroy.
3276. J. H. Grell.
3289. A. V. Newton.
3290. A. Woods.
3291. T. Berney.
3307. C. E. Brooman.
3337. S. and J. J. Perry.
3305. W. Campion.
3321. J. M. Gray.
3428. F. Leonardt.
68. J. Silvester.
3331. G. Davies.
3354. W. E. Newton.
3357. C. Lungley.

Patents on which the Stamp Duty of £100 has been Paid.

3394. I. Holden.
3392. S. C. Lister.
3397. W. S. Longridge.